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AMERICAN
DYESTUFF REPORTER
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# THE NEED FOR STANDARDIZING ACCELERATED AGING TESTS FOR LATEX-BACKED FABRICS

ROY H BOGGS and MAX TAITEL

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*Cambridge, Mass*

**In recent years, the textile industry has been producing multifiber fabrics for upholstery and rugs in combination with any one of a variety of synthetic latices used as a backing compound base. The individual efforts of textile mills and backing suppliers to predict the aging properties of these backed fabrics have resulted in a disorganized accumulation of accelerated aging tests. In recognition of the need for bringing order to this situation, it is recommended that a committee, representative of the interested industries, be formed to study and standardize on testing procedures for accelerated aging of latex-backed fabrics. (Such a committee recently was formed as a sub-committee of Committee D-13 by the American Society for Testing Materials).**

**This paper develops the problems involved by describing some of the complex conditions that exist, citing some of the tests now being used, and emphasizing the lack of correlating data.**

**Some suggestions are made for a possible approach that a committee could use to cope with these problems.**

## THE NEED FOR STANDARD TEST METHODS

FOR A number of years the application of a latex-backing material to upholstery fabrics was considered to be a necessary evil, even though its function was to prevent fabric pile from falling out during processing. This thinking has changed considerably in the past few years, especially with the advent of newer-type latices which perform much better than the older types, and is in keeping with the better performance of newer-type fibers being used in upholstery fabrics. In fact, latex is now considered to be an integral part of the fabric-finish system and, as such, is just as important to the ultimate performance of a fabric as are fabric yarns, dyestuffs, water-repellent systems and any other finish that might be necessary to produce a salable fabric.

Although latex as a fabric backing is considered a necessity, there is a lack of correlation between present laboratory performance tests and actual field results. This is entirely due to the absence of industrywide standard test methods in determining the performance characteristics of a latex-backed fabric as relates to ultimate performance after the fabric has been in use from six months to two years. In other phases of the textile industry, we already have standard test methods set up by ASTM, AATCC and other organizations so that at least a guide is furnished the user of such materials as dyestuffs, water-repellent systems, resin finishes, yarns and fabrics. Even if these standard test methods do not afford complete correlation with field usage, they do enable the user of such materials to make intelligent decisions so that proper selection can be made in order to produce the best finish obtainable based on economics and end-use desired. In determining the ultimate performance of latex-backed fabrics, it is just as important to have standard aging test methods as it is to have test methods to show the lightfastness of dyestuffs. These aging tests should show what may be expected of a backing compound as relates to the development of fabric stiffening, discoloration of backing and development of odor. These conditions cannot be checked merely by visual observation of the performance of the latex during processing. A more realistic test might be to subject the fabrics to Florida sunlight for about six months. It is obvious this type of testing cannot be put to use within the textile economy of today. Therefore, short laboratory test methods must be devised that will give an indication of what will happen to a latex-backed fabric under actual consumer conditions.

There is some precedent for concern over lack of this type of standardization. In an article entitled "Dyeing & Finishing Rayon Tufted Carpets," Woodruff (*1*) states that new accelerated aging test procedures for rubber-backing materials are being investigated. However, private communication from Mr Woodruff one year later indicates that no progress along these lines is forthcoming.

A complicating factor is the varying relationship between accelerated aging and normal aging for different types of latex. Latex A, for example, will show no discoloration and stiffening at elevated temperatures, whereas Latex B will show some or even considerable discoloration and stiffening. Yet it is perfectly feasible for both latices to perform acceptably during the life of the fabric. This may mean, therefore, that separate standards might be necessary to cover separate types of latex. The same may also be true for separate types of fibers contained in the backed fabric. It might even be necessary to set up subdivisions to cover different curing systems using the same latex base.

A second complicating factor is the lack of standardization in methods of treating the fabrics before subjecting them to test. There is no guide of any kind to make constant any of the treatment steps either from test to test or laboratory to laboratory. In Table I are listed some of the variables that must be controlled.

**TABLE I**

**Variables to be controlled in treatment of fabric before testing**

1) Base fabric to be used
2) Method of coating
3) Amount of coating applied
4) Time and temperature of cure
5) Curing equipment to be used
6) Conditioning of fabric before dying*
7) Dyeing procedure to be used*
8) Conditioning of fabric before testing

*Nonapplicable to fabrics coated after dyeing.

## PRESENT TESTING PROCEDURES

A state of confusion exists primarily because latex manufacturers, as well

*(concluded on page 350)*



Allied Chemical

# NEW DEVELOPMENTS IN TEXTILE PRESERVATION

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## INTRODUCTION

THE use of treating agents to impart to cellulosic materials resistance to microbial attack is not new, as is evident from the fact that ancient fisherman and mariners used tars, gums, cutch, and other natural products to impart some degree of fungal resistance to rope and fabric. The far-flung operations of World War II emphasized the need for better protection of all types of natural fibers, particularly fabric and cordage. As a result, there has been a continual stream of new treating compounds or methods for the preservation of such materials, much of which has been directed toward military requirements.

The textile and cordage industries have, in recent years, shown increasing interest in the use of fungal-resistant treatments for their general line of finished goods. This interest appears to be stimulated by the increasingly competitive market situation, which is apparent in most industries today, and by the fact that the substantially improved treatments, as demonstrated by military experience, provide the opportunity for merchandising a product greatly improved in quality. While there may have been some fears of diminishing markets as the result of a more durable product, the possible competition from synthetic fibers has become a more serious threat. Experience has shown that the added factor of fungal resistance in natural fibers can assist greatly in retaining the position of these materials in competition with the synthetic fibers.

In nature, the decomposition of unwanted organic matter, by microorganisms in particular, is a very useful function. When goods useful to man are attacked, however, this function of microorganisms is unwanted and results in economic losses amounting to many millions of dollars a day. Various insects, protozoa, fungi and bacteria are capable of degrading cellulose to simpler organic compounds and finally to carbon dioxide and water.

The activity of fungi and bacteria in degrading cotton begins in the boll, continues in the bale, occurs in processing and during the life of the finished goods. Certain difficulties in processing, such as short staple, "fly", and uneven dyeing, are attributable to bacterial and fungal action on the raw fiber. Musty odors and staining during processing and on the finished goods are also due to the action of these microorganisms. The useful life of many finished cotton fabrics is considerably shortened by the attack of fungi. This can happen at any time when humidities are above 60%, although this is not a hard and fast rule since some fungi function at lower humidities. Temperature is not as critical as is humidity since some fungi will carry on their life processes at temperatures close to the freezing point or as high as 180°F. It is not uncommon to find *Pullularia pullulans* growing on the underside of a fabric awning which at times during the day may heat to 180°F.

The genera of fungi and bacteria capable of degrading cellulose are too numerous to discuss in an article of this nature. In addition to Pullularia, various Aspergillus, Penicillium, Trichoderma, and Botryodiplodia species are among the most common fungi found on textiles. Various species of bacteria are encountered, but their effects upon textiles are not as obvious as are those of fungi.

In order to overcome the deteriorating activities of microorganisms, the addition of fungitoxic agents to textiles has been a long-standing practice. Simple inorganic compounds, such as copper sulfate or carbonate, cuprammonium hydroxide, zinc chloride and chromates, were first used. Replacement of these by metallic organic compounds and by organic compounds occurred rapidly after the beginning of World War II, so that, at the present time, little, if any, inorganic compounds are employed.

In applying treating agents or processes designed to impart fungal resistance to textiles, one strives for the ideal of producing this property without altering any of the desirable properties of the fabric. When one considers factors such as color, odor, hand, water repellency, permanency to laundering, drycleaning, or weathering, it is evident that much is required of a textile fungicide, and no one compound has yet met such ideal requirements. However, in the variety of fungicides available, and with the newer products being offered, there is a sufficiently wide selection to permit the textile treater to choose the one most suitable for the intended end use.

The utility of a fungicide is, of course, the primary requirement, and this is best determined through exposure to actual end-use conditions. Since this is not often possible, several laboratory techniques have been developed which permit evaluation of a compound. Among the tests, the soil-burial technique and pure culture tests employing organisms known to deteriorate textiles are perhaps the most widely employed. Mixed culture tests and enriched soil suspension tests also, on occasion, are specified. When comparisons are made against fungicides of established performance, the tests are valid and useful. It is not our purpose to discuss methodology, and the merits of the various methods therefore are not considered; however, it is generally agreed that the soil-burial tests are the most severe.

There are two methods whereby mildew resistance may be achieved in cellulosic materials. One is by treating with a fungicidal agent; the other is chemical modification of the cellulose molecule. It is open to discussion as

to whether the latter may be considered a treatment or whether it should be regarded as a method for producing a synthetic fiber in which cellulose is one raw material. However, such a discussion would be academic if the appraisal of any particular method indicated that, based upon performance and cost, the chemical modification yielded a distinct advantage over treatment with a fungicide.

## CHEMICAL MODIFICATION

Two well-known methods for chemically modifying cellulosic fibers have been discussed in detail in numerous articles. These are acetylation and cyanoethylation, wherein a portion of the hydroxyls of the cellulose molecule have been reacted with the specific chemical. Both processes result in a fabric much more resistant to microbial deterioration than was the original cellulosic material. Exterior exposure of fabric in contact with soil has shown excellent results after a two-year period. However, in spite of this remarkable performance, there are process complexities as well as high unit costs which, when compared to conventional fungicidal treating compounds, place such treatment at a disadvantage.

In recent months, a new process has been publicized, which claims a reaction between the cellulose molecule and copper formate to form a copper complex in the fiber, thus rendering the cellulose resistant to microbial attack. In soil-burial tests conducted in our laboratory, with fabric treated by the originator of the process, excellent performance was obtained through 16 weeks. However, comparable performance was obtained with conventional treatments, such as copper naphthenate, solubilized copper 8-quinolinolate (Quindex, Cunilate 2174), and a new, solubilized copper complex of N-nitroso N-phenyl hydroxylamine, more commonly known as copper cupferron (Fungitrol 25). Both the copper-formate treatment and copper-cupferron treatment show a distinct color advantage over the conventional copper fungicides, with copper cupferron showing the greatest advantage. Comparative performance is shown in Table I.

## FUNGICIDAL TREATMENT

This subject regards those fungicides which are applied to fabric or cordage by conventional treating procedures, as opposed to chemical modification. Most of the fungicidal treatments used at present are of the nonreactive type, and are applied by standard padding operations.

In the use of chemical additives to impart mildew resistance to fabrics, we, as well as others, have found that, in the treatment of lightweight fabrics, a higher concentration of fungicide is necessary per weight of fabric to achieve the same degree of mildew resistance as for a heavier weight textile. Greater exposure of the individual fibers in lightweight fabrics in all probability accounts for this. Soil burial tests, in particular, bear this out. Thus, a four-ounce fabric will require more fungicide per unit weight than a 12-ounce material. Not only weight but type of weave is important. On open-mesh fabric, we have found that a level normally sufficient for protection of a close weave fabric may not be functional.

In the treatment of textiles, the cost of handling the goods is often greater than that of the treatment. A desirable fungicidal compound, therefore, is one which can be applied with other fabric finishes so that application is more economical, or, if it is used alone, requires a minimum of processing equipment for application. Most of the fungicidal agents presently employed meet these requirements.

For convenience in discussion, the various fungicides available for textile treatment are divided into arbitrary groups related to the type of fabric being processed. The placing of a compound in one group does not necessarily imply that it is limited to that type of fabric.

HEAVY-DUTY TEXTILES——Fungicides for heavy-duty textiles are generally applied in combination with water repellents, fire retardants, and pigments. Such items as tentage fabric, hatch covers, temporary irrigation ditch dams, and industrial tarpaulins are among the group. In addition, treatments for heavy webbings and rope may be included in this classification. The fungicides that have had the widest usage in this area are copper and zinc naphthenate. Copper naphthenate, because of its higher antifungal activity, has been more prominently used where color is not a deciding factor. At levels of 0.4% to 0.8% copper, depending upon the nature of the additional materials used on the fabrics, excellent performance is achieved. Solubilized copper 8-quinolinolate has also been used in such applications, but the high cost of the fungicide has limited its use in these goods. The usual level is 0.1% to 0.2% copper.

Copper cupferron in its solubilized form shows excellent performance in this application as demonstrated by the data shown in Table I. Although this material has been regarded thus far only on an experimental basis for textiles, it has been known as an excellent fungicide for some time. Its previous limitations were high cost and insolubility, both of which have been corrected by extensive research efforts. In activity, it is comparable to solubilized copper 8-quinolinolate, but has the potential of lower applied cost and substantially improved color. It may be applied from solvent solution, water dispersion, or in combination with water-repellent materials. The remarkable feature of this product is that treated fabric does not have the characteristic blue or green copper color, but is an off white to grayish green color at concentrations normally required. Odor on the finished goods is nil. The product exhibits good weathering characteristics and does not accelerate the degradation of the cotton fabric more than that of the untreated control, as shown in Table II. The solvent treatment also has been found to impart a good degree of water repellency without added waxes or other water repellents.

Mammalian toxicity studies show the solubilized copper cupferron to be in the same range as several of the solubilized copper 8-quinolinolate formulations presently on the market. The oral $LD_{50}$ is approximately 3,000 mg/kilogram, which is of the range considered practically nontoxic. The product is thus suitable for the same areas of application and, in fact, can

**TABLE I**
**Relative performance of copper fungicides[1]**

| Treatment of 9-oz duck | Theoretical % Cpd depos | Fungicide by chem. analysis % Metal active | Color | Soil-burial test % Retained tensile str Weeks incubation: Unleached 4 | Unleached 8 | Unleached 12 | Unleached 16 | Leached 4 | Leached 8 | Leached 12 | Leached 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Untreated fabric | — | — | off white | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Copper naphthenate | 10.0 | 0.75 | lt blue grn | 99 | 89 | 89 | 84 | 94 | 92 | 41 | 62 |
| | 17.5 | 1.23 | deep blue grn | 99 | 95 | 87 | 83 | 92 | 90 | 62 | 51 |
| Solubilized copper 8-quinolinolate | 8.32 | 0.14 | yel green | 91 | 95 | 78 | 46 | 82 | 70 | 32 | 41 |
| | 16.64 | 0.29 | deep yel grn | 93 | 93 | 89 | 76 | 94 | 88 | 77 | 67 |
| Solubilized copper cupferron | 5.55 | 0.20 | v lt grey grn | 98 | 92 | 86 | 89 | 91 | 87 | 77 | 72 |
| | 11.10 | 0.39 | grey green | 100 | 93 | 83 | 85 | 97 | 90 | 73 | 80 |
| Copper-formate treatment | — | 0.29 | bluff to brown | 100 | 100 | 98 | 91 | 100 | 89 | 89 | 83 |

[1]No auxiliary treatments such as water repellent were used in this study.

## TABLE II

### Effect of copper cupferron on fabric after natural[1] and artificial weathering

| Treatment of 9-oz duck | Theoretical % Metal active depos | Theoretical % Cpd depos | Deposition by chem analysis % Copper metal | Residual breaking strength after weathering: 14 Weeks outdoor | Residual breaking strength after weathering: 100 Hours Weather-Ometer |
|---|---|---|---|---|---|
| Untreated fabric | — | — | — | 77 | 92 |
| Solubilized copper cupferron | 0.05 | 2.14 | 0.04 | 74 | 98 |
| | 0.10 | 4.28 | 0.10 | 78 | 100 |
| | 0.20 | 8.56 | 0.17 | 81 | 92 |
| Solubilized copper 8-quinolinolate | 0.05 | 4.27 | 0.06 | 79 | 89 |
| | 0.10 | 8.55 | 0.10 | 71 | 91 |
| | 0.20 | 17.10 | 0.19 | 72 | 92 |
| Untreated fabric +5% wax | — | — | — | 77 | 91 |
| Solubilized copper Cupferron +5% wax | 0.05 | 2.14 | 0.05 | 80 | 88 |
| | 0.10 | 4.28 | 0.11 | 77 | 80 |
| | 0.20 | 8.56 | 0.19 | 77 | 89 |
| Solubilized copper 8-quinolinolate cupferron +5% wax | 0.05 | 4.27 | 0.05 | 75 | 90 |
| | 0.10 | 8.55 | 0.09 | 76 | 85 |
| | 0.20 | 17.10 | 0.17 | 77 | 82 |

[1]Exposed 45° South at Cranbury, New Jersey.

## TABLE III

### Synergistic zinc mixture as a fabric preservative Efficiency in soil burial

| Treatment of 9-oz duck | Theoretical % Metal active depos | Theoretical % cpd depos | Chem analysis % Metal (zn) active | After treatment Color | Soil-burial test % Retained tensile strength Weeks incubation: Unleached 2 | Unleached 4 | Unleached 6 | Leached 2 | Leached 4 | Leached 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Untreated fabric control | — | — | — | off-white | 0 | 0 | 0 | 0 | 0 | 0 |
| Zinc naphthenate | 0.64 | 8.0 | 0.62 | off-white | 93 | 18 | 0 | 34 | 6 | 0 |
| | 1.00 | 12.5 | 0.88 | off-white | 90 | 34 | 11 | 41 | 12 | 0 |
| | 1.60 | 20.0 | 1.35 | off-white | 100+ | 67 | 21 | 48 | 12 | 0 |
| Synergistic zinc mixture | 0.0825 | 2.5 | 0.09 | off-white | 92 | 90 | 89 | 45 | 10 | 0 |
| | 0.1650 | 5.0 | 0.25 | off-white | 93 | 93 | 84 | 100+ | 94 | 96 |
| | 0.3300 | 10.0 | 0.32 | off-white | 95 | 91 | 93 | 95 | 88 | 89 |
| | 0.6600 | 20.0 | 0.57 | off-white | 99 | 94 | 89 | 95 | 94 | 94 |

## TABLE IV

### Synergistic zinc mixture—Manila rope Efficiency in soil burial

| Treatment of 3-ply Manila rope, ⅛" diam | % Zinc metal | % Cpd depos | Soil-burial test % Retained tensile strength Weeks incubation: Unleached 2 | Unleached 4 | Unleached 6 | Leached 2 | Leached 4 | Leached 6 |
|---|---|---|---|---|---|---|---|---|
| Untreated cord control | — | — | 33 | 8 | 4 | 36 | 8 | 3 |
| Synergistic zinc mixture | 0.165 | 5.0 | 86 | 89 | 85 | 100+ | 100+ | 100+ |
| | 0.330 | 10.0 | 87 | 91 | 91 | 95 | 99 | 94 |
| | 0.495 | 15.0 | 85 | 83 | 84 | 100+ | 100+ | 98 |
| | 0.660 | 20.0 | 100+ | 97 | 97 | 89 | 91 | 97 |

be utilized where the high cost of solubilized copper 8-quinolinolate limits its use.

Data accumulated over a two-year period indicate consistently good performance comparable to that obtained with 0.2% copper as copper 8-quinolinolate. This fungicide is not only useful for heavy-duty application, but should find use in the treatment of lightweight fabrics as well. Shoe liners, sheetings and twills used as base fabric for vinyl coatings where the slightly off-white color will not be critical are some of its possible uses.

In some of the heavy-duty textile applications, and in the treatment of cordage, rope and hose jackets, a colorless fungicide is required. Zinc naphthenate is generally chosen although its fungicidal activity leaves something to be desired. Furthermore, the odor and stiffening effect of this compound mitigates against its use in certain applications. It, like copper naphthenate, however, is a compound of low toxicity and, because of this, does find favor in a number of applications. During the past few years, several zinc fungicide compounds have appeared and are used in a limited way. Our laboratories have developed a synergistic zinc mixture (Fungitrol 50), which in activity on a zinc metal basis is approximately tenfold more active than zinc naphthenate and has a very low odor level. In soil-burial test, this product is active at 0.165% zinc through six weeks exposure with practically no loss in tensile strength. This has been demonstrated on rope as well as fabric, results being shown in Tables III and IV.

This fungicide formulation is easily emulsified so that it can be applied from water systems, as well as from organic solvents. The resulting treatment in either case is, for all practical purposes, colorless. The product is no more toxic than zinc naphthenate ($LD_{50}$—6 grams/kilogram), which is considered practically nontoxic.

For far superior performance than that obtained with zinc naphthenate and some of the other available zinc compounds, this zinc mixture is expected to be less costly to use.

As with the solubilized copper cupferron, the zinc mixture will expand the areas where the use of a textile fungicide will be practical, not only in the production of heavy-duty fabrics and cordage, but also as a treatment for lighter fabrics used in vinyl coating where a high degree of fungicidal activity is desired.

LIGHTWEIGHT FABRICS———In this group can be included such items as base fabric for vinyl coatings used in upholstery and wall coverings, shoe liners, and sporting goods fabrics. There have also been recent trends in sanitary treatments for bed linens and wearing apparel which would fit in this classification.

A number of fungicides are used, including dihydroxy dichlorodiphenyl methane, chlorinated salicylanilides, chlorinated phenols, the coconut amine salt of tetrachlorophenol, phenyl mercury acetate and quaternary ammonium compounds. In addition, certain light, stable silver salts have been offered recently for some of these applications.

Several of these uses require resistance to soil burial, while others must meet only pure culture tests to determine fungal or bacterial resistance. For some, the solubilized copper cupferron and the synergistic zinc mixture previously discussed are quite functional.

Among the antimicrobial compounds used, the quaternary ammonium naphthenates have found favor in some areas because of their low toxicity, lack of color, low odor, and their sustained activity in soil burial as well as in pure culture tests. They may be applied from solvent- or water-dispersible formulations. The latter method is preferred by the majority of users.

Recently, an improved quaternary ammonium naphthenate (Fungitrol 100) has been developed which provides superior activity per unit cost. It is available in a solvent-soluble, water-dispersible, and a substantive

**Figure 1**

**The underside of a vinyl-coated lawn umbrella. The black spots are due to growth of *Alternaria solani* or a related species of Alternaria. This umbrella was used one season in the Massachusetts area.**

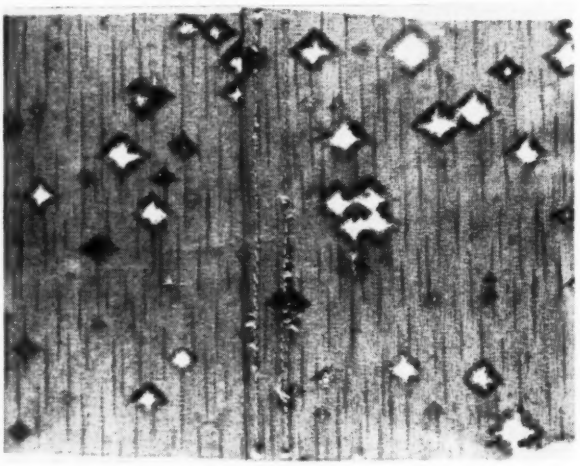

**Figure 2**

**A piece of awning fabric, which, after the second season of use, began to show the characteristic diamond pattern of fungus attack. The causative organism was a species of Pullularia. The fabric came from Ohio.**

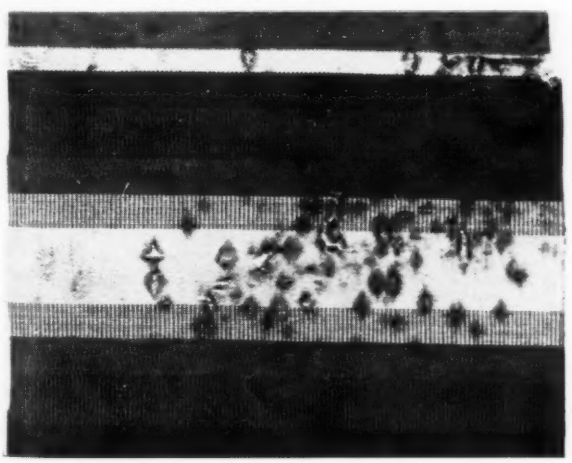

**Figure 3**

**This is a similar fabric to that shown in Figure 2. The causative fungus is also Pullularia. It came from the St. Louis area.**

## TABLE V
### Some textile fungicides and their applications

| | Awnings | Book fabrics | Cotton & jute bags | Cordage | Convertible car tops | Fire hose (lined) | Fire hose (unlined) | Industrial scrims | Irrigation ditch dams | Jute rug cushions | Mattress covers & fillers | Paper felt | Plant nursery burlap | Rope manila | Rubber-coated base fabric | Rug backings | Sheetings | Shoe liners | Sport goods | Tarpaulins | Tentage | Vinyl-base fabric | Webbings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chlorinated phenols | | x | x | x | | x | | x | | | | | | | x | x | x | | x | | | | |
| Chlorinated salicylanilides | | | | | | | | | | | | | | | | | | | | | | | |
| Coconut amine salt of tetrachlorophenol | | | | | | | | | | | | | | | | | | | | | | | |
| Copper hydroxy naphthenate | | | x | x | | x | x | x | x | x | x | | x | x | x | x | x | | x | x | x | | |
| Copper naphthenate | | | x | x | | | x | | x | | | | x | x | | | | | | | | | |
| Copper-rosin amine compounds | | | | | | | | | x | | | | | | | | | | | | | | |
| 2, 2' Methylene bis(4 chlorophenol) | | | | | | x | | x | | | | | | | | | | | | | | | |
| Other quaternary ammonium compounds | | x | | | | | | x | | | x | | | | x | x | x | x | | | | x | x |
| Phenyl mercury acetate | | x | | | x | | | | | | x | | | | x | x | x | x | | | | | |
| Phenyl mercury oleate | | | | | x | | | | | | | | | | | x | x | | | | | | |
| Quaternary ammonium naphthenate | x | x | | | | x | x | x | x | x | x | | | | | x | x | | | | | | |
| Salicylanilide | | | | | x | | | | | | | | | | | | | | | | | | |
| Solubilized copper cupferron[1] | x | | x | | | | | | | | | | | | | | | | | | | | |
| Solubilized copper 8-quinolinolate | x | | x | x | | x | x | | x | | | x | x | x | x | x | x | x | x | x | x | x | x |
| Synergistic zinc mixture[1] | x | | | x | | x | | x | x | x | | | | | | | | | | | | | |
| Zinc naphthenate | x | | | x | | | | | x | x | | | | | | | | | | | | | |
| Zinc-rosin amine compounds | x | | | | | | | | | | | | | | | | | | | | | | |
| Zinc salts of 2-mercaptobenzothiozal & dithiocarbonate | x | | | | x | | | | x | | | | | | x | | | | | x | x | | |

[1] New products discussed in this paper.

formulation. This latter type is useful in batch treatment of finished textiles such as bed linens or clothing items where a given amount of fungicide is to be added to the fabric by means of a laundry wash wheel or similar apparatus. Simple quantitative methods have been developed which permit close control of the deposition of the microbicide by determining the degree of exhaustion of the fungicide from the treating bath.

PRESERVATION DURING PROCESSING——This application is a specialized function where it is desirable to use fungicides or microbicides to protect fabric from mildew during processing. The same treating agents as discussed under the heading of light fabrics are found useful in this application. Generally speaking, much lower levels of fungicide are needed for this type of protection. Some of these, such as the quaternary ammonium naphthenate, present the advantage of providing residual activity without fugitive properties—a factor to be considered in long term storage.

A summation of the more frequently employed textile fungicides and the areas in which they are used is shown in Table V.

## CONCLUSION

The use of fungicidal treatments can, it is believed, enhance the position of cellulosic textiles. With the great variety of products offered for such treatment, the proper material may be selected in terms of the fungicidal requirements, permissible cost and other performance characteristics. This wide variety of products, while a benefit to the consumer, also creates an element of confusion as to the product most useful in a particular application. However, a number of manufacturers of industrial fungicides maintain well equipped and competently staffed laboratories to assist their customers in selecting the best product to meet their requirements.

The textile industry has long been aware of the desirability of using fungicides in particular applications; however, the cost of treatment has mitigated against a broad utilization of such materials. The new treatments and compounds of higher activity should now encourage a new look because of reduced costs, improved performance and the merchandising values which may be obtained.

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## Need for Standardizing—

*(concluded from page 345)*

as mill laboratories and furniture manufacturers, very often use testing methods that are not related to the methods used by each other. For instance, a latex supplier will perform a certain set of aging tests on a particular type of compound. The textile mill using the compound may subject it to an entirely different set of conditions. Finally, the furniture manufacturer with testing facilities may subject the compound to a third set of conditions. By the time the compound gets through these testing procedures, there may have been one or two of the methods used which would closely correlate with actual consumer usage. At the present time, no one seems to know which tests most closely correlate with actual wear conditions.

Time-temperature cycles for aging of latex compounds applied to fabrics vary from 140°F to 300°F with a time variation from 2 hours to 330 hours. These various test conditions prevail today and oftentimes are used without regard to the effect on certain synthetic fibers at these temperatures or what effect these fibers have on determining the true aging performance of a latex.

In Table II are listed some of the specific accelerated tests which are being used and some of the properties which are thought to be significant.

**TABLE II**

**Various Aging Tests Now in Use**

| A) Heat Aging | Comments |
|---|---|
| 165 and 330 hrs @ 160°F-170°F<br>24 and 48 hrs @ 200°F-210°F<br>24, 48, 72 and 96 hrs @ 250°F-260°F | Generally speaking, nonstiffening is the property sought after here. Discoloration of the rubber is generally considered of little significance. However, standards for either stiffness or discoloration are nonexistent and little correlation data to actual performance are available. |
| **B) Light Aging** | **Comments** |
| Direct exposure to sunlight<br>4 weeks exposure to north light<br>20, 40, 60, 80 hrs Fade-Ometer exposure | Both face and back exposed. In this case, minimum discoloration of backing is most sought-after property. Some are interested in effect of backing on shade, using a sensitive dye, such as Pyrazole Fast Blue 2GLN. Once again, standards are nonexistent and there is little correlating data available. |

## SUGGESTIONS FOR COMMITTEE WORK

It will not be an easy matter to produce industrywide standard test methods for the aging of latex without the full cooperation of organizations such as fabric manufacturers, upholsterers, and latex suppliers. A committee composed of representatives from the above organizations would hopefully make some order from the chaotic conditions now prevailing in the testing of latex-backed fabrics.

We do not believe this to be a hopeless task despite the complexities described. Here are some starting suggestions for consideration by a committee:

1) Set up a long-range program to determine correlation between various tests now in use and normal aging.
2) Set up tentative methods and standards now, based upon best present knowledge of various latices and fibers in current use. For example, the outline of subject matter in one such test could be as shown in Table III.

**TABLE III**

**Example of subject matter in theoretical test**

Tentative Aging Test No.—
(Dyeing After Backing)

A) Conditioning of unbacked fabric
B) Coating method to be used
C) Curing method to be used
D) Dyeing method to be used
E) Testing method to be used

## CONCLUSION

It is believed that this paper will have served its purpose well if it does nothing more than stimulate sufficient interest so that a study be made of this problem to determine a course of action. It is certainly assured that, if positive results are obtained from such a study, all phases of the industry will be benefited, and, most important of all, the ultimate consumer will be getting merchandise worthy of the price.

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May 20, 1957

Delaware Valley Section———

# AUTOMOTIVE FABRICS FACTORS WHICH AFFECT LIGHTFASTNESS

C H A SCHMITT
*Sandoz, Inc*

There are a great many factors in the design of automotive textile fabrics which influence the success of the dyer in obtaining the end-use fastness requirements of those materials used for auto-seat coverings, sidewalls, head lining, and floor carpeting. Since the change from wool and wool/cotton fabrics to combinations of synthetic fibers, problems have developed in fastness to light and water due to indiscriminate choice and blending of the newer fibers. Designing and developing of fabrics without maximum cooperation with the textile plant, dyer or dye manufacturer prior to wearing can contribute to the problems of the dyer. Errors in design are generally unknown until after the first piece has been dyed.

The relative lightfastness of various fibers and their location within the fabric in relation to fastness requirements is explained as well as the influence of latex backings on shade and light stability and the relation of copper content of dyestuffs to this problem. The need for good resistance of dyes to leaching in water and the problem of reserving nylon is discussed.

The questionable methods used by some segments of industry to evaluate lightfastness and the variables which occur in suntesting are explained and a few examples of the work by the special AATCC committee which has been studying the problem are explained in some detail.

It is emphasized that the development of new dyes to meet the new requirements is not done overnight, and in order to keep abreast of conditions, the dye industry must be kept well informed and have the cooperation of all concerned.

## INTRODUCTION

BECAUSE the bulk of automobile fabrics, upholstery, carpets and head lining are dyed in the piece, one of the first points we wish to emphasize is that *dyeing may be the final operation, but the first indicator of trouble, past and future.*

Much time could be spent in explaining the various reasons for the troubles which are never discovered until after the goods are dyed. The success of this final operation depends on many factors, some of which we will discuss in this paper. We will attempt to explain some of the factors which govern the methods of dyeing, affect production and the quality of the finished product.

## DISCUSSION

EFFECT OF BLENDING OF VARIOUS LOTS OR TYPES OF ONE FIBER ON FINAL RESULTS——— As is so often the case in fabrics of all types of construction, errors of all types, such as improper blending or selection of fibers, location of different fibers, choice of color combinations and improper preparation or finishing before dyeing, are completely unknown until the cloth comes out of the dyehouse.

A good example of this is the piece of nylon fabric shown in Figure 1. In the undyed state, it appears to be perfectly satisfactory (above). However, after dyeing with colors to meet certain fastness requirements, we obtain a terrible result (below). Immediately the dyehouse is accused of a poor job, whereas the fault is one due to mixing of nylon yarns of different quality and dye affinity.

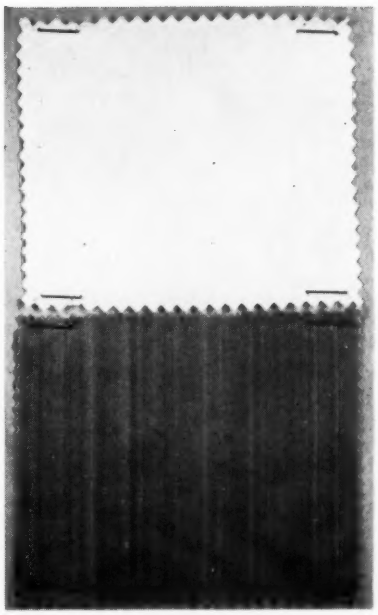


**Figure 1**
**Nylon tricot before and after dyeing**

EFFECT OF FIBER TYPE ON LIGHTFASTNESS———Inasmuch as a great many auto fabrics are constructed with nylon on the face, one of the most important requirements—lightfastness—can vary tremendously, depending on the type of nylon. Because of its durability, there is a great deal of #300, or high-tenacity type nylon used. In addition to its great strength, it also exhibits the best lightfastness. On the other hand, it does not have the best dyeing properties, and for some constructions would be out of the question. Use of #200, a delustered type, generally results in weaker dyeings and fastness to light of a very much lower order, whereas type #100 is generally between #300 and #200 with regard to lightfastness.

Another problem confronting the dyehouse, if and when changes are made in the type of nylon used in a fabric, is the different degree of staining by the direct dyes used on the cotton or viscose portion, with the spun type staining very much more than the filament.

In Figure 2, note the different degree of staining of nylon of the direct dyes we selected as having the required properties for fastness. (Dyed at ½% on 50% viscose, 50% filament nylon):

* Presented before the Delaware Valley Section on November 2, 1956 at the Drake Hotel, Philadelphia, Pa.

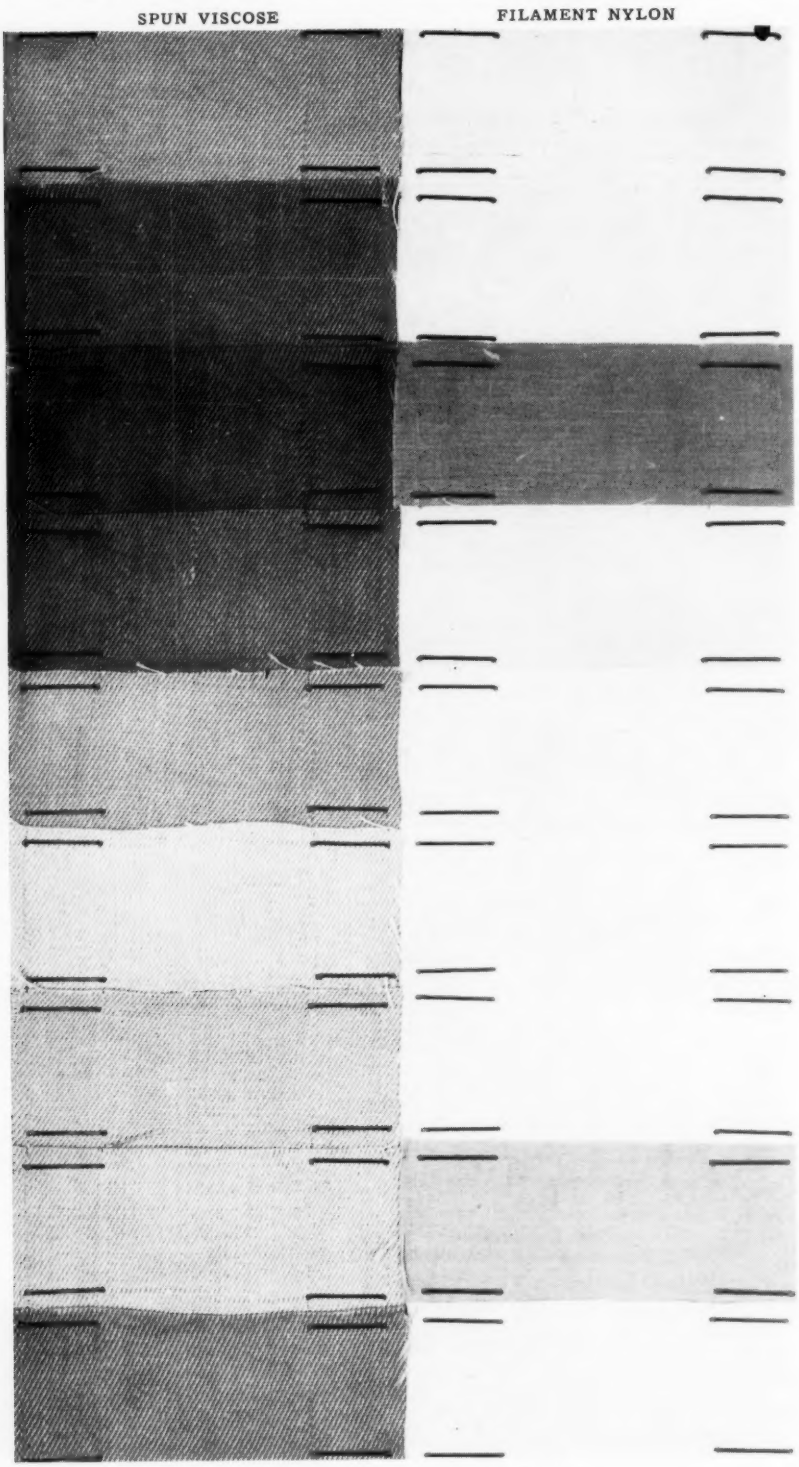

SPUN VISCOSE
FILAMENT NYLON
0.5% Lumicrease Yellow 3LG Pat
0.5% Lumicrease Yellow EFUL
0.5% Lumicrease Orange 3LG Pat
0.5% Pyrazol Fast Red 6BL
0.5% Pyrazol Fast Rubine BLN Pat
0.5% Lumicrease Red Violet 3LB
0.5% Pyrazol Fast Blue FGL Pat
0.5% Lumicrease Green 3LB paf
0.5% Lumicrease Grey 3LB Pat

**Figure 2**

Lumicrease Yellow 3LG Pat (S)——— nylon left white
Lumicrease Yellow EFUL (S)——— nylon left white
Lumicrease Orange 3LG Pat (S)——— nylon stains heavily
Pyrazol Fast Red 6BL (S)——— nylon stains lightly
Pyrazol Fast Rubine BLN Pat (S)——— nylon tinted lightly
Lumicrease Red Violet 3LB (S)——— nylon tinted a trace
Pyrazol Fast Blue FGL Pat (S)——— nylon left white
Lumicrease Green 3LB paf (S)——— nylon dyed deeply
Lumicrease Grey 3LB Pat (S)——— nylon stains lightly
Lumicrease Grey 3LR (S)——— nylon tinted a trace
Lumicrease Bordeaux FRL (S)——— nylon tinted lightly
Lumicrease Grey 3LBN paf (S) (an improved type of Grey 3LB———leaves nylon white

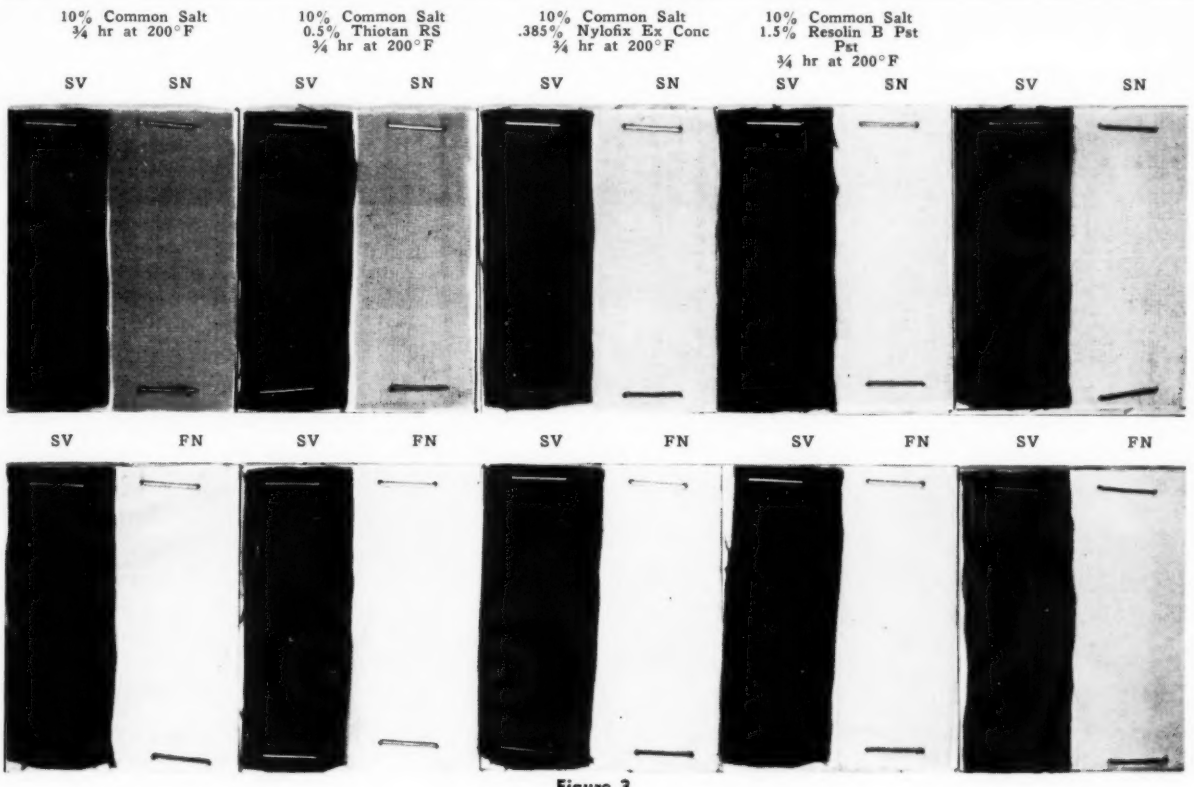

10% Common Salt
¾ hr at 200°F
10% Common Salt
0.5% Thiotan RS
¾ hr at 200°F
10% Common Salt
.385% Nylofix Ex Conc
¾ hr at 200°F
10% Common Salt
1.5% Resolin B Pst
Pst
¾ hr at 200°F
SV SN SV SN SV SN SV SN SV SN
SV FN SV FN SV FN SV FN SV FN

**Figure 3**
**0.5% Pyrazol Fast Red 6BL**
**Fade-Ometer Tests—Standard Hours**

SV—Spun viscose SN—Spun nylon FN—Filling nylon

If all these preferred dyes for the cellulose would leave the nylon white or only lightly stained, our problems would be much easier. Unfortunately, Lumicrease Green 3LB paf, a color having lightfastness well beyond your requirements, goes more on the nylon than on the cellulose. Fortunately, the stain on nylon is very fast to light, but as you can observe, is bluer and therefore needs shading with special acid dyes.

The orange is a similar problem but much less than the green.

Some dyes show excellent reserve, while others show different degrees of staining, which forces the dyer to use reserve agents in order to leave the nylon white or permit proper control of his shading.

The swatches shown in Figure 3 illustrate how effectively different reserve agents work on both spun and filament nylon, and under most conditions Resolin B Paste gives the best results (4th from right). Note how much more the spun type stains than does the filament.

Then there is the problem of lightfastness of the stain. If the stain is fugitive, it offsets part of the fast acid color used to shade the nylon.

COMBINATIONS OF TEXTILE FIBERS WHICH DEVELOP PROBLEMS IN SHADE PRODUCTION AND PROPER FASTNESS——

I believe that this matter is pretty well understood and straightened out at the present time through past experience and cooperation between the auto fabric designers and mill chemists. However, for the benefit of uninformed persons, it should be explained. A few years ago we were faced with an impossible situation in trying to produce suitable fastness on fabrics made from impractical blends, particularly those which included both acetate and nylon.

Figure 4 shows the effect of an acetate color on nylon and acetate. Note the poor union or tone-on-tone effect produced by the color. Of more concern is the poor fastness to light and cold water of the acetate colors on nylon or acetate. Unfortunately, no aftertreatments have been developed to date to improve wetfastness of most acetate colors. As a result of these problems, the use of acetate in auto fabrics was given up, except in certain fabrics where it was left white to produce certain effects. On the other hand, the good characteristics of acetate can be used if the fiber is dope-dyed, that is, colored in the mass or liquid-dope form, as it is called, with special pigment colors, such as the Acetofils or Acetosols and other types. In this manner, one can produce beautiful multicolor effects and with excellent fastness. These precolored yarns can be woven in with white cotton or viscose and suitably cross dyed either into solid shades or in two or three tones. Selected direct dyes are used on the cotton or viscose with special neutral-dyeing acid dyes for the nylon. As both the cellulose or nylon colors will not dye the dope-dyed acetate, many pleasing three-color effects can be obtained.

One draw-back to the use of dope-dyed yarns is the problem of economics. Shades on dope-dyed yarns are limited in order to produce each shade in sufficient quantity, but this forces the weaver to properly anticipate his needs and carry enough stock to maintain his schedule. However, the chance of cloth cancellations due to style or color preference changes has been one of the major objections to its use.

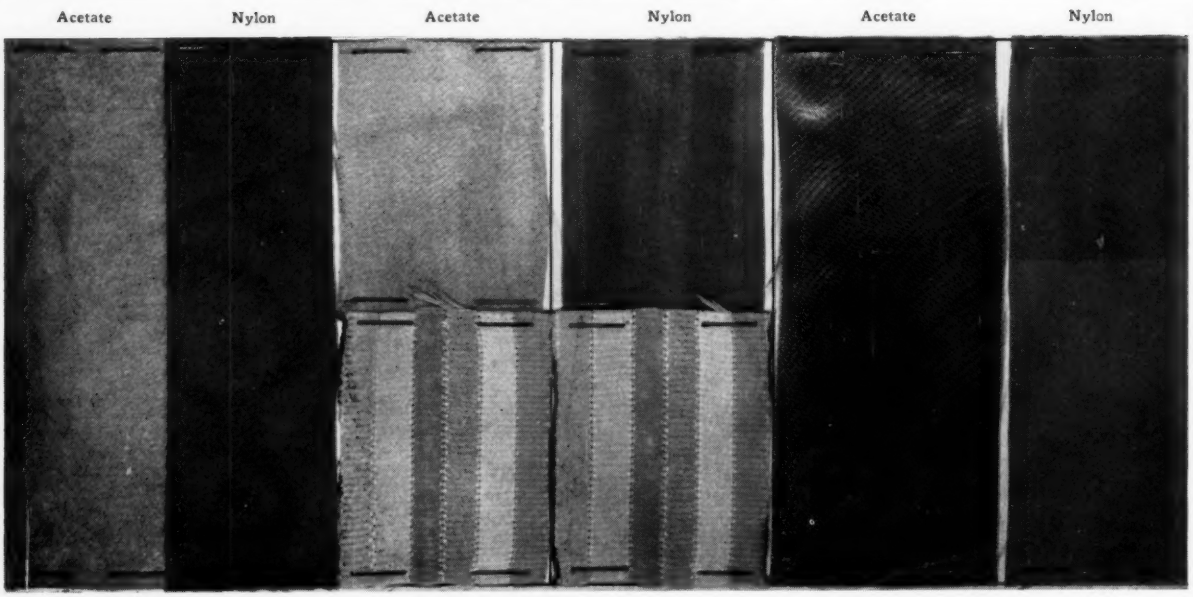



**Figure 4**
**0.5% Artisil Direct Red 3BP Conc**
(Acetate and nylon dyed in one bath)

INFLUENCE OF LOCATION OF DIFFERENT FIBERS WITHIN THE FABRIC IN MATCHING OF SHADES AND FASTNESS PROPERTIES——Another problem which confronted us in the first days of auto fabrics composed of various fibers other than wool was the indiscriminate location of those fibers in the fabric. Here again the designers have learned their lessons well, and today we believe the majority of fabrics are constructed with an appreciation of the relation of fiber location to fastness properties. For the benefit of those who may not be familiar with these problems, we will give a few examples and explanations.

As you well know, the matter of lightfastness is very important, in that auto upholstery is exposed to much more sunlight than the fabrics on furniture in our homes or the clothes on our back. Frequently, this exposure occurs with all windows closed and at temperatures of 175°F and higher. Inasmuch as high temperature increases the rate of fading of many dyes, it is important that the fiber used on the face of the cloth be one for which colors of maximum fastness are available. For piece dyeing of blended fabrics we have said that the best lightfastness is obtainable on nylon #300, followed by nylon #100 and then #200. Close behind the nylons for lightfastness is bright viscose, then spun viscose, with cotton the lowest. If mercerized cotton could be used, there would be considerable improvement in the results.

In this rating of fibers for lightfastness, I have excluded acetate for reasons previously explained. In the case of dope-dyed viscose with some of our Viscofil colors, I believe this would move into first place on many shades, with lightfastness up to 320 hours. As mentioned before, when considering dope-dyed fibers one has the problem of supply, price and, of most difficulty, inventory control.

Therefore, if the best lightfastness is obtainable with existing dyes on nylon, then it is important to have as much of this fiber on the surface as possible. To obtain style effects and other features on the surface, the use of bright filament viscose can be used with only a slight loss in fastness. However, only colors of the highest lightfastness should be used. As for the cotton component, which is used to add bulk as well as to keep the cost down, this should be used principally in the back, or show through only as small effects.

Many shades will show good fastness on the cotton portions, but on very long exposure they begin to fall behind the bright viscose or nylon. The main trouble comes on those fabrics where there is a bar or stripe of two or three cotton threads at close and regular intervals. With a large proportion of such cotton effects on the surface, the overall fastness to light suffers, even though the nylon or bright viscose is still unfaded.

FINAL CHOICE OF COLOR COMBINATIONS AND THE IMPORTANCE OF COOPERATION BETWEEN STYLING, TEXTILE ENGINEERING, THE MILL CHEMIST OR DYER, OR WITH REPUTABLE DYESTUFF COMPANY SERVICE DEPARTMENTS——So many times designers become enthralled with the virtues of some new fiber, but without any advice as to its dyeability, either alone or in combination with other fibers. As a result, thousands of yards are woven and sent out to be dyed either solid or in two-tone shades. Often this offers no problem as far as producing the shade until the mill tries to meet the fastness specification.

In the case of auto fabrics, we have worked closely with many mills, and in the majority of cases we have met the specifications on most shades, and in many instances have shown great improvement. However, when Detroit asks for turquoise, chartreuse, flame red and lavender shades to meet that severe water test and have excellent fastness to light, crocking and solvent spotting, etc, that is when we wish we had a desk right in the Styling Department.

I do not know just what the procedure is for making the first samples, but it would seem to me that once the style departments decide on the construction of a fabric, they follow a

plan we use in our laboratories in working out a problem of suitable fastness on a blended material. Take the proper percent of yarn or cloth of each of the fibers going into the blended fabric and send it to the mill laboratory, or ours, and ask that the combination be dyed into the various shades being considered. Once we have the shade, then fastness tests can be made on the individual fibers. In this way we will learn 1) whether we can get the shade, 2) which, if any, fiber is falling down in fastness. In other words, the styling department will know whether or not it can put out two, four, six or eight shades on a given style that will pass the tests without manufacturing a single piece of cloth. Unless such a plan is followed, one does not know whether the choice of fiber, construction or selection of color was correct until after the first piece has been dyed, and then it might be too late.

EFFECT OF ARTIFICIAL LIGHT ON DYESTUFFS AND FABRIC STANDARDS———One of the properties of dyestuffs that is not always understood, and one quite often ignored, is their reaction to different forms of light. Another factor that is also overlooked is the relation of this phenomenon to the color perception of various individuals. Many times there are arguments between the seller and buyer of cloth, as well as between individuals within the organizations of the seller and buyer, as to the accuracy of the shade submitted against a standard sample. If the submitted sample of production is dyed with the same dyes as the standard, then there is very little cause for disagreement, because most all parties will agree it is okay or that one is redder or yellower or bluer than the other.

The major source of disagreement comes when a submission is made against a standard where dye formulation is totally different—a condition which is obviously bound to exist. Many times the mill is required to produce a certain fabric of similar shade to a standard made in a different plant, of different construction and fibers and, therefore, with different dyes. Because no two dye types have identical spectral curves either in daylight or artificial light, especially under yellow light of the tungsten or mazda type, it stands to reason a problem will develop.

To illustrate this better, we prepared a taupe shade made with a blue, red and yellow, and approximated it with the same red and yellow but a different blue.

Under a Macbeth light or in good daylight it is a reasonable or an approximate match. However, when we view these two grey fabrics under a yellow light, one becomes a red brown because the blue used in the swatch turns from a clear blue to a violet in artificial light, thereby throwing the combination all out of line.

Another pair of dyeings of a different shade illustrates the problem, and points up the importance of a clear understanding between the buyer and producer. Many times it is impossible for the dyer or our laboratory to match the submitted shade in artificial light and still meet the requirements. However, there are times that the buyer is unaware of the change of shade of the standard in artificial light and needs only to have it brought to his attention for the problem to be solved for everybody.

Another point which should be discussed is that the shade which gives the least trouble to match (that is, for shade only) in the laboratory or dyehouse and the one which will provide the least chance for disagreement among the users of the goods is the shade produced with a dye combination which is stable in all lights. When a car manufacturer has been buying cloth from one plant and wants a second source of supply, then it is mandatory that production from the new source matches in every way both for shade in daylight and artificial light and fastness. If two sources matched only for shade in daylight, then at night, in a car with the lights on (or in a show room where sales begin), the seat cushion could be blue, while the back cushion would be a violet. Then, if the fastness to light of the two sources of fabric was different, a year of exposure to sunshine might create a disagreeable combination of fabric color in one car.

THE EFFECT OF STYLE OR CONSTRUCTION ON DYEHOUSE PRODUCTION AND DELIVERIES ———Fabrics which are perfectly flat can be dyed on jigs, where the constant rolling up under pressure will have no crushing effect. Many constructions have to be dyed on a jig because dyeing them in a beck in rope form would develop bad cracks or crease marks. This type of equipment is generally found in commission dyehouses and is especially suited for dyeing of small yardage; jigs will take from 500 to 1000 yards, depending on the weight or thickness. The main problem with fabrics which require jig dyeing is the shade matching from roll to roll, and the difficulty of producing large yardages of the same shade. In this business, you definitely need excellent matching from piece to piece in order to have all sections of the car upholstery the same shade.

ADVANTAGES OF BECKS OVER JIGS———Whereas one can dye 2000 to 3000 yards or 20 to 24 pieces in a beck, and all reasonably close in shade, it will require two to six jigs, depending on their size and weight of the cloth, to turn out the same yardage, but with the chance of wide shade variations from lot to lot.

In beck dyeing one obtains better rinsing after dyeing, which helps very much as far as waterfastness is concerned.

DYEING OF CARPETS———We bring this subject in at this point because the construction affects the method of dyeing.

Because most of today's attractive car-floor coverings are of the pile type, they are best dyed in the beck or kettle. In some plants they are dyed full width, and three or four pieces run in one beck, depending on beck size. Certain types of carpeting, which might suffer from abrasion during dyeing are folded over and tacked. This tacking causes them to balloon, and assists materially, as in other types of piece dyeing, to improve penetration. Through better movement of the cloth through the liquor, better leveling is obtained.

PAD-BECK SYSTEM FOR CARPETING ——— Another method of dyeing auto carpeting is by the pad-beck system. Because of construction, pile depth and types of backing, many obstacles have been encountered, but it has been worked out satisfactorily at a tremendous saving of beck time and the advantage of increased production.

For the dyeing of auto carpeting, we recommend the same fast-to-light dyes for the viscose as used on the body fabric with fastness to water obtained by the same methods as for the latter. Some constructions contain approximately 10% of nylon, which, because of the small amount, can generally be disregarded. Quite often there is enough staining of the nylon by the direct dyes to give a satisfactory solid appearance. However, the Lanasyn colors we recommend for dyeing the jute back also go on the nylon. The effect of rubber backing on the shade and fastness will be discussed later.

VAT COLORS, THEIR PLACE

AND LIMITATIONS IN DYEING OF AUTO FABRICS——Many times men from the auto plants have asked me why vat colors are not used more in the dyeing of auto fabrics. This is a natural question in view of the general acceptance by the layman of vat colors as synonymous with excellent fastness.

True, extreme fastness to light, water, washing, perspiration and other properties are possible with vat colors, but this statement is principally true when applied to cellulosic fibers. We have stated earlier that it is the cotton in auto fabrics which has the lowest fastness to light of the fibers commonly used with it, i e, viscose and nylon. Therefore, why not use vat colors on the cotton?

90% of all auto fabrics are dyed in the piece for reasons of economy, inventory and flexibility of production to meet style and color changes. However, in applying vat colors to auto fabrics, we have the problem of the nylon component to contend with. The problems involved are many.

The normal procedure for dyeing the cotton to obtain the maximum fastness produces very weak shades on nylon, especially the filament type. Furthermore, crocking and lightfastness of most are extremely poor on nylon. It is possible to increase the absorption of vats on nylon by raising the dyeing temperature from the normal 120-140°F to 190-212°F, but, unfortunately, there are not many which will stand this high temperature, and some actually decompose.

I have here a series of exhibits which show that, even when the hot method is used for getting vat colors on nylon, the depth is either low or insufficient, and generally of poor lightfastness. These cards show swatches of the color of the cotton back and the nylon face with 60-hour Fade-Ometer tests mounted on the right.

Dyeings were run by the

1) Reduced method.
2) The pad-jig method.
3) The continuous pad-steam system.

In the case of Sandothrene Blue NGR Ultrasperse (*CI* #1113), it could not be dyed hot because it would actually decompose. It stains nylon only slightly when dyed by any of three methods, but the stain is quite fast to light at 60 hours.

As for green shades which are so popular, Sandothrene Brilliant Green N2BF Double Paste Ultrasperse (*CI* #1101) dyes the nylon very blue, but imparts very poor lightfastness. The same goes for most reds, such as Sandothrene Red N6B Ultrasperse (Pr #124).

Sandothrene Brown NR Double Paste Ultrasperse (*CI* #1151) dyes the nylon slightly, but shows only fair fastness at 60 hours.

It has been reported that deeper shades can be made on nylon by using the vat-acid method, but, due to incomplete oxidation or conversion after scouring, many of the dyes bleed in the soaping and affect the fastness and levelness of the pieces as well as crocking and staining other fibers.

In the presence of cotton or viscose, these fibers absorb the bulk of the color, leaving less of it for the low-drawing nylon. This means that one has to resort to a long two-bath process in order to dye the nylon with suitable colors, such as the Lanasyns or other fast neutral-dyeing colors. This requires a great deal of care to be sure that all the caustic and hydro are completely rinsed out before attempting to dye the nylon.

In spite of all the objections we have cited, we can tell you that some of your suppliers have, through sheer necessity and perseverance, applied vat dyes and other colors to cotton, viscose, nylon fabrics and obtained good results, but the methods are very trying and costly.

HEAD LINING MATERIAL——Before concluding my remarks on vat colors, I have a direct recommendation for their use on head lining material.

In the past, miles of this material, usually a 100% cotton flannel type, was dyed with sulfur colors. The cost of dyeing was very low, and on some shades the fastness was very good. Then came the era of bright colors. However, the only reasonably bright colors in the sulfur range are one or two shades of blue. As a result, dyehouses had to turn to the brightest direct colors or those being used on the upholstery.

Unfortunately, the application of these dyes is done generally on jigs, and presents the problem of a limited number of pieces of one shade. In other words, a jig will handle only 6 to 800 yards at one time, which means that the shade from 10 jigs could vary one to the other, and cause the troubles in production we discussed a while ago.

Up to the present time, the application of direct dyes to lots of 10-20,000 yards by the continuous method has not been perfected, but we hope before long to be able to do this. We therefore believe that the use of vat colors on head lining by any of the continuous methods is to be recommended because of:

1) a large range of bright shades
2) excellent fastness
3) production of large yardage of the same shade, and
4) reasonably low cost inasmuch as most shades are fairly light in depth.

Following is a set of eight formulas for shades on cotton/viscose head lining for 1957 model automobiles, where the head linings are dyed with vat colors by the pad-steam method (padded at 120°F with 70% pickup).

| Oz per gal | Dyestuff | CI or Pr No. |
|---|---|---|
| | **Greenish yellow** | |
| 0.3300 | Ponsol Yellow 5GLL Pst | |
| 0.0035 | Sandothrene Brill Green N2BF Dbl Pst | CI 1101 |
| 0.0133 | Sandothrene Black NDRB Pst Ultrasperse | Pr 289 |
| | **Green** | |
| 1.33 | Sandothrene Brill Green NBF Dbl Pst Ultrasperse | CI 1101 |
| 0.20 | Sandothrene Golden Orange N3G Pst Ultrasperse | Pr 290 |
| 0.55 | Sandothrene Olive N2B Dbl Pst Ultrasperse | Pr 293 |
| | **Turquoise** | |
| 1.15 | Sandothrene Brill Green NBF Dbl Pst Ultrasperse | CI 1101 |
| 0.87 | Sandothrene Blue NGR Pst Ultrasperse | CI 1113 |
| | **Greenish Blue** | |
| 1.42 | Sandothrene Blue NGR Dbl Pst Ultrasperse | CI 1113 |
| 0.66 | Sandothrene Brill Green N2BF Dbl Pst Ultrasperse | CI 1101 |
| | **Blue** | |
| 1.110 | Sandothrene Blue NGR Dbl Pst Ultrasperse | CI 1113 |
| 0.533 | Sandothrene Brill Green N2BF Dbl Pst Ultrasperse | CI 1101 |
| | **Tan** | |
| 0.355 | Sandothrene Brown NBG Dbl Pst Ultrasperse | CI 1152 |
| 0.177 | Sandothrene Brown NBR Pst Ultrasperse | Pr 118 |
| 0.133 | Sandothrene Yellow NP2GA Dbl Pst Ultrasperse | — |
| | **Light grey** | |
| 0.244 | Sandothrene Black NDRB Pst Ultrasperse | Pr 289 |
| 0.266 | Sandothrene Olive NT Pst Ultrasperse | Pr 547 |
| | **Grey** | |
| 1.333 | Sandothrene Black NDRB Pst Ultrasperse | Pr 289 |
| 0.177 | Sandothrene Brill Green N2BF Dbl Pst Ultrasperse | CI 1101 |
| 0.133 | Sandothrene Olive NT3R Pst Ultrasperse | Pr 547 |

USE OF PIGMENTS ON AUTO FABRICS——In recent years the application of pigments to fabrics has grown tremendously, both for solid shades and also for printing. These pigments, applied to the goods with a resin binder, give good fastness to light and washing, except that in commercial laundering there is a tendency of the color to chip off due to abrasion. Unlike regular dyes, which become locked within the fiber, these products are more or less painted on the surface.

When car styling divisions suddenly came up with turquoise and other bright shades for car exteriors, it was

natural that the fabric men wanted something similar for shade and brightness. Unfortunately, the only dyes for wool or nylon to make a true turquoise shade have poor light fastness. For cotton and viscose, we have a direct turquoise, but this product has very poor fastness to water and crocking, although excellent to light.

The idea came to us to apply the pigment type of turquoise with a binder, and our results were excellent as far as shade, fastness to light, water and perspiration were concerned. Naturally, the method could be applied only to fabrics of smooth, flat construction. However, the whole idea came to an end when we applied the solvent spot-cleaning test. Certain solvents soften the binder, leaving the color free for easy removal. A few rubs and enough color comes off to leave a light spot. Until such time as new binders can be developed to resist solvent spotting, there is little chance of using this system of color application.

RUBBER BACKING AND ITS EFFECT ON DYESTUFFS——— One of our most difficult problems is the effect of certain rubber coatings or backing on the dyestuff. Strangely enough, there is a reverse action here in that certain dyestuffs in turn affect the rubber.

The main difficulty arises from the fact that the small amounts of copper left in the fabric, either from the dye or by contamination, will start deterioration of the rubber. Inasmuch as the value and life of the backing is principally needed only until the fabrics are cut, one might believe that there would be very little trouble except when certain fabrics went into inventory for a long period of time. Unfortunately, the other reaction starts to work, whereby the rubber has the property of breaking the bond between the dye molecules and the copper put into the dye to give it improved lightfastness. As a result, many dyes of excellent lightfastness start to fade rapidly if used on fabrics coated before or after dyeing.

Two years ago, we made dyeings on cotton-back mohair pile fabric, both rubberized and unrubberized, with six different dyes, three copper-free and three with high copper content. When originally dyed, the two dyeings (plain and rubberized) were the same shade. After exposure to 20 and 60 hours in the Fade-Ometer there was no visible difference.

Recently we had occasion to refer to these tests and found a great change of shade had taken place. Whereas the three practically copper-free dyes,

Pyrazol Fast Blue BS (Pr 71, .001% cu), Pyrazol Fast Brown C (.005% cu), and Pyrazol Fast Bordeaux 2BL (Pr 421, .0013% cu)

had shown no shade change, three of the high-copper-containing dyes showed a marked change. Pyrazol Fast Blue 2GLN Pat containing 1.54% Cu had turned very much redder. Pyrazol Fast Brown BRL (Pr 47) containing 2.31 Cu had turned very much yellower. Pyrazol Fast Rubine BLN Pat containing 2.75% Cu had turned very much yellower.

All of this points up the need for developing more colors such as Lumicrease Green 3LB paf (S), one of the few direct dyes which approaches the lightfastness of vat colors, and yet is copper-free, and therefore not a rubber-problem color.

On the other hand, one must not condemn all copper-containing colors where rubber backing is concerned, because many auto fabrics have only nylon on the face, and the lightfastness problem is more or less eliminated. However, if viscose or cotton is used as a stripe or spot effect, the damage to the shade or fastness on these small portions showing on the face can destroy the overall appearance. Also, the degree of color degradation varies with the thickness of the pile. That is, the higher the pile, the less penetration to the surface by the rubber coating and the lower the degree of color change by light or storing. The shorter the pile or thickness of the fabric, the greater the chance for color failure on the cellulosic portions.

Another reason for not being too alarmed over the copper-rubber problem is the great strides being made in compounding of the latex backing compounds. We know of many cases where plants are gaining the benefits of the high lightfastness of many of the copper-containing direct dyes, because of the new latex compounds. However, the South Central Section's 1956 Intersectional Contest Paper on the effect of latex compounds on color fastness (*1*) brought out some interesting new facts. In addition to wide shade variations caused by latex compounds containing certain dithiocarbamates, a marked loss of color in a #2 wash test on direct dyes containing copper was noted. None of the four latex formulas used had any effect on lightfastness, but we would attribute this to the deep one-half-inch pile of the fabric used in the tests. While no effect on shade was noted in the accelerated aging test, we would suggest that the Committee re-examine its tests two years from now to see if natural aging develops shade changes.

Until we can produce more copper-free, fast-to-light direct colors or develop trouble-free latex or other backing compounds, we hope auto fabrics will be designed so that there is a minimum of cotton showing on the face.

TEST METHODS AND THEIR EFFECT ON COLOR CHOICE AND AFTERTREATMENTS———This is a subject that can develop into a long discourse, but I do want to discuss it because I believe the quality control sections in the auto industry are much concerned with the subject of trying to develop test methods which will give a fair prediction of the future life of fabrics.

At first glance, many technicians are critical of the high-temperature water test. However, those of us working on light test methods are aware of the high temperatures prevailing inside a car. If a car fabric gets wet on a hot day, it is only a short time before the fabric is getting a warm water test. We know that dyes dissolve and migrate more in warm water than in cold water, and for my part, I believe the test is realistic, and surely on the safe side, for fabric producers or dyers.

In order to meet this severe test, it is necessary to aftertreat many dye formulations with special compounds. Many of these, like the Sandofix WE brands, do a wonderful job (see Figure 5), but too many times a mill will use far more than is necessary and, as a result, lightfastness is reduced. Our WE-51 brand is so efficient that as little as .06% will stop leaching. Unfortunately, too many times these products are applied to dyes which, without aftertreatment, have only the bare minimum lightfastness. It is this type of color (Pr #432) which shows bad lightfastness after this treatment. (See Figure 6). On the other hand, if only the recommended top-notch direct colors are used, then loss in lightfastness from such treatments is negligible. For example, with Lumicrease Grey 3LB Pat (S), we obtained perfect fastness to the GM water test with a minimum of Sandofix WE, and when tested to the more severe Chrysler test, there was just a bit more bleeding, but good enough to pass.

The best way to improve waterfastness without loss of lightfastness is to aftertreat with a copper resin compound, such as Cuprofix #52. ¼% on the weight of the goods is generally

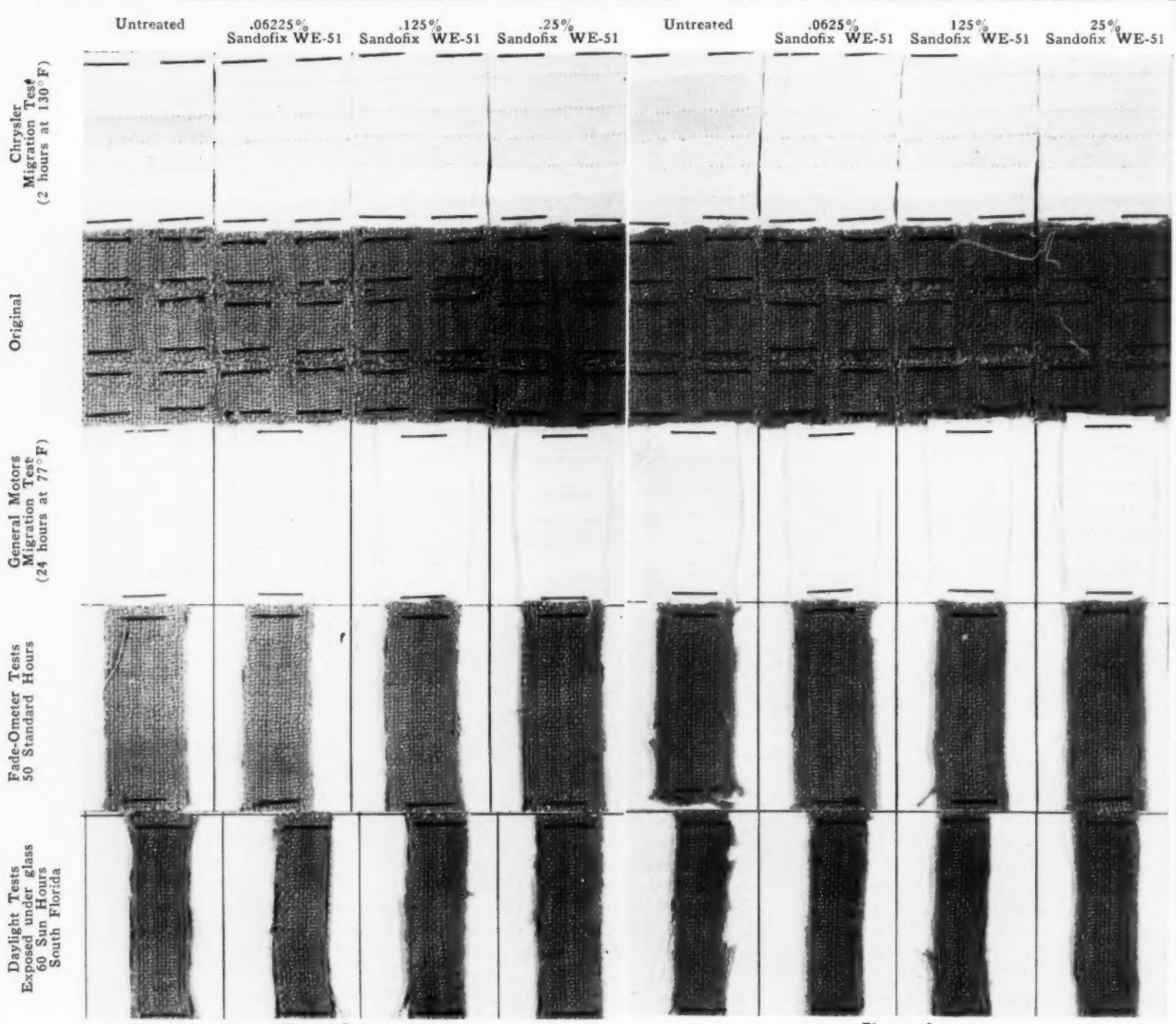

Untreated
.05225% Sandofix WE-51
.125% Sandofix WE-51
.25% Sandofix WE-51
Untreated
.0625% Sandofix WE-51
125% Sandofix WE-51
25% Sandofix WE-51
Chrysler Migration Test (2 hours at 130° F)
Original
General Motors Migration Test (24 hours at 77° F)
Fade-Ometer Tests 50 Standard Hours
Daylight Tests Exposed under glass 60 Sun Hours South Florida

**Figure 5**
**0.5% Lumicrease Green 3LB paf**

**Figure 6**
**0.5% Pyrazol Fast Sky Blue 6 GUL**

EDITOR'S NOTE: We regret that the above illustrations do not adequately point up the differences cited in the text. In the presentation of this paper, Mr Schmitt illustrated his points by means of colored slides.

enough to fasten most of the fugitive colors to pass the water test. We feel that, after rinsing, the amount of copper retained by the goods is so small that it should cause very little reaction with the rubber backing.

Tests are being conducted to find out more about the amount of copper retained, but in the meantime, I believe this method should be given a fair trial, especially where plants have improved latex formulas.

Another method to improve waterfastness is to aftertreat with Cerol B, a special type aluminum acetate. This method causes less loss of lightfastness, but does not give the same degree of water resistance as do the Sandofix types. By combining Sandofix WE-51 and Cerol B the advantages of both products are obtained, that is, better waterfastness with less damage to lightfastness.

To sum up this matter, we say, "Do not put on an aftertreatment until you are sure it is necessary, and then use only the required minimum. On many light shades, aftertreatment is totally unnecessary with the proper dyes.

LIGHTFASTNESS —— Having worked with the Fade-Ometer since 1924, I have seen the machine, operational methods and the interpretation improved so that troubles from poor correlation with sun or daylight testing is at a minimum, or at least we generally know where and when to watch for trouble.

In the case of nylon, which is generally used on the surface and takes the brunt of sunshine or light, the Fade-Ometer test is generally in your favor because the majority of dyes on nylon show ½ to 1 point better fastness in daylight, and with some dyes as much as two or three points.

OTHER CAUSES OF VARIABLES IN LIGHTFASTNESS ON NYLON —— Earlier, we referred to nylon quality as having a bearing on nylon colorfastness. In our AATCC lightfastness studies, we have noted that a combination of high temperature and excessive humidity has a very destructive action on many dyes on nylon. For example, in a car which has been closed all night, or during cooler parts of the day, there can be

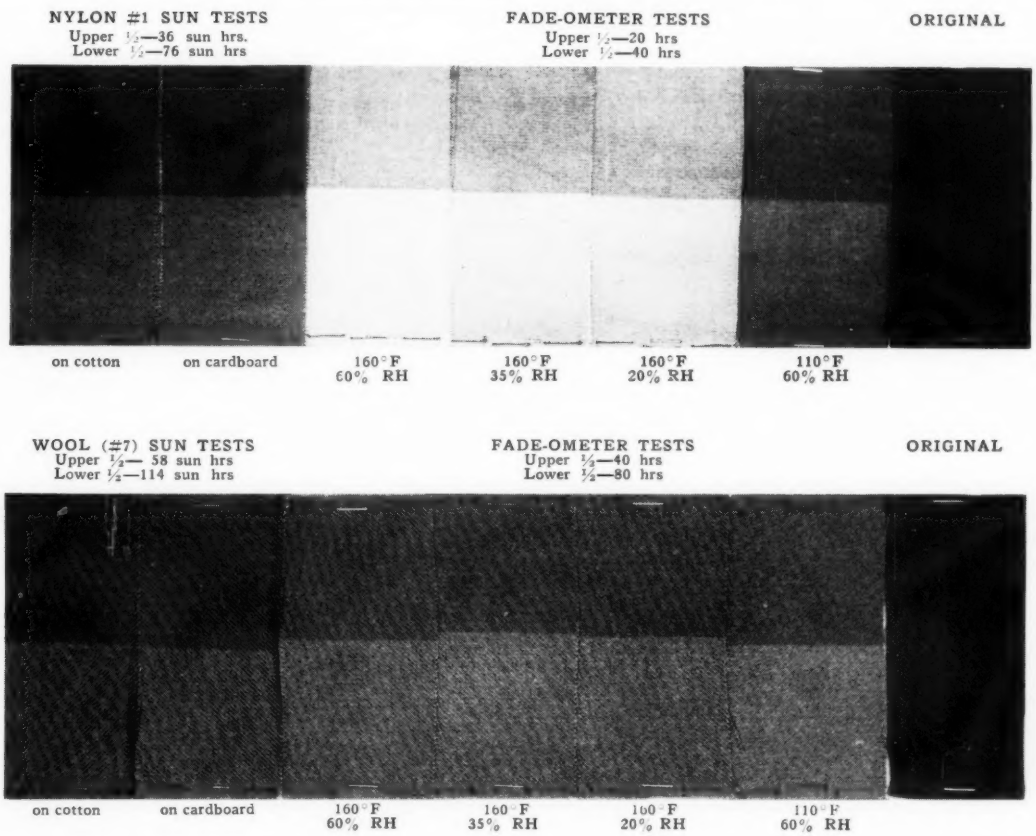



**Figure 7**
**Acid Light Yellow 3G (*CI* 636)**

an accumulation of moisture and, when the sun strikes the fabric, high humidity and high temperature. Let us look at a few tests to illustrate what happens to some fairly fast dyes on nylon. (See Figure 7).

In these tests, made by Charles Seibert in our AATCC research Fade-Ometer built especially for us by Atlas Electric Devices Co, we ran tests for 20 and 40 or 40 and 80 hours under conditions of 160°F Black Panel Temperature and 60% RH, 160°F Black Panel Temperature and 35% RH, 160°F Black Panel Temperature and 20% RH, and 110°F Black Panel Temperature and 60% RH.

Tests for the equivalent number of sun hours were also run and are shown on the two swatches on the extreme left of Figure 7, one mounted on cotton (L), the other on cardboard.

On nylon (upper row), a low temperature of 110°F and excessive humidity (60%) show appreciable fading at 40 hours, and better than 160°F and 35% RH, whereas swatches run at 160°F and 60% RH are completely destroyed. The wool swatches below show superior fastness and only a trace of variation.

Figure 8 shows similar results on Cyanine Green GSN (*CI* 1078) and Irgalan Grey BL, a neutral dyeing metallized grey.

We believe these tests explain why some of the nylon face fabrics are falling down in actual use, although they appear to be satisfactory in laboratory tests. True, the test at 160°F and 60% RH is very severe, but I believe it is significant. It is one of the reasons why we are recommending the fastest dyes for nylon showing 160-hour fastness to normal testing in medium depths. Similar tests made on cotton, viscose and wool showed only a few cases of abnormal fading by a combination of high temperature and humidity. Most of the problems on cotton or viscose are due to a few direct dyes which are really not fast enough under normal conditions. Much of the serious trouble can be traced to a combination of particular types of rubber backing and high copper content dyes, which we discussed a while ago. But one of the prime causes of most failures to light exposure on auto fabrics has been through the use of a direct blue of the class under Pr #432.

SUNLIGHT VERSUS DAYLIGHT ——— Some of you are probably aware of the work being done by a special task group of AATCC. At a meeting in Detroit two years ago, I took exception to a claim that Fade-Ometer tests were not checking with sunlight tests and that it required dyestuffs which would stand 160 hours in the lamp to equal 90 sun hours in Florida. Not only did we know the correlation figures were wrong, but when it was reported that there were no dyes fast enough on cotton or viscose, I again took exception. Finally, when the opinion developed that fading of dyes occurred only above an erythemal level of .823 grams calories per square centimeter, I was still more puzzled.

If, as claimed, it took 160 hours in the Fade-Ometer to equal 90 hours exposure under glass in Florida, then

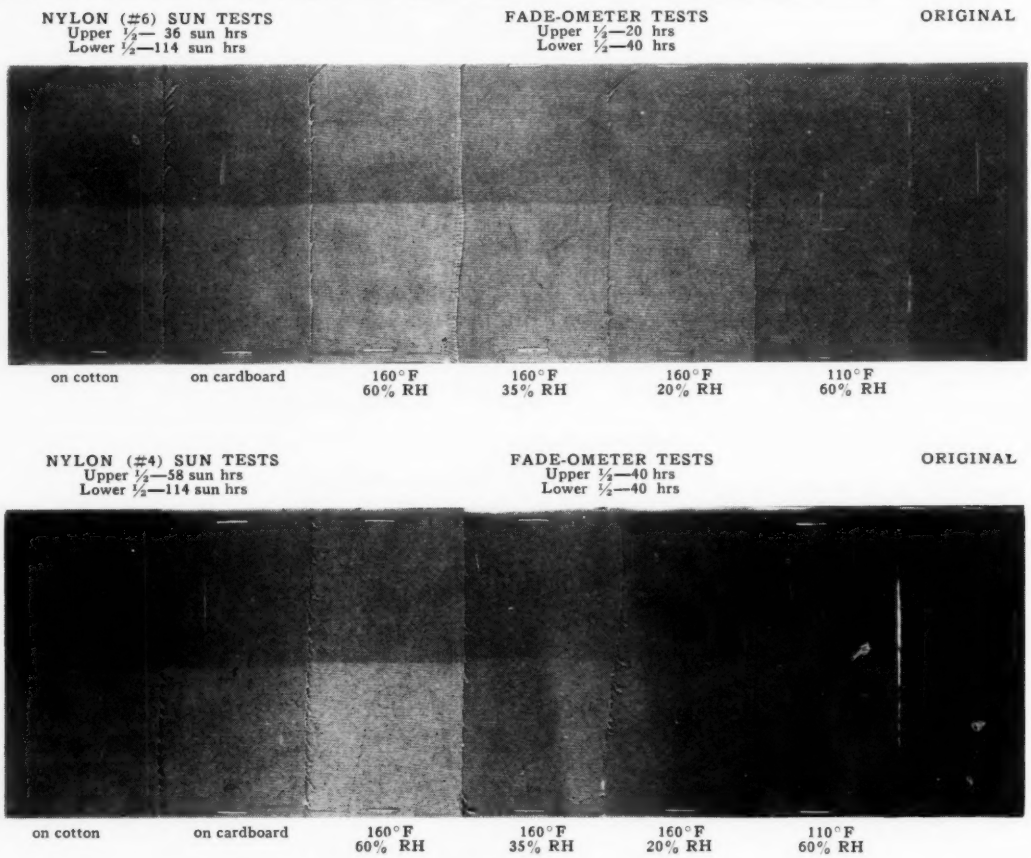



**Figure 8**
**Upper—.50% Irgalan Grey BL**
**Lower—.50% Cyanine Green GNN (*CI* 1078)**

one of two things was wrong: 1) the generally-accepted rule that 90 Fade-Ometer hours were approximately equal to 100 hours in Florida, or 2) the method of making sun tests.

After three months of preliminary testing, by the writer, of various dyeings at different suntesting stations, we concluded that the methods being used by industry should be investigated and the present AATCC sun test method reviewed.

We wish to emphasize that we cannot criticize the test stations, because, as they advised me, they run sun tests according to instructions given them by their clients. Apparently the AATCC standard method for suntesting was being completely ignored or misinterpreted by many, and vague and false opinions have been raised as to how to expose samples and calculate the amount of exposure.

As a result of my preliminary findings, the AATCC Lightfastness Committee asked me to head up a special task group to study the problem. My main reason for accepting this task was that I knew of mills having had cloth turned down for lightfastness which had been acceptable two or three months before. Furthermore, the auto industry seemed to think that there was a complete lack of suitable direct dyestuffs to meet their requirements.

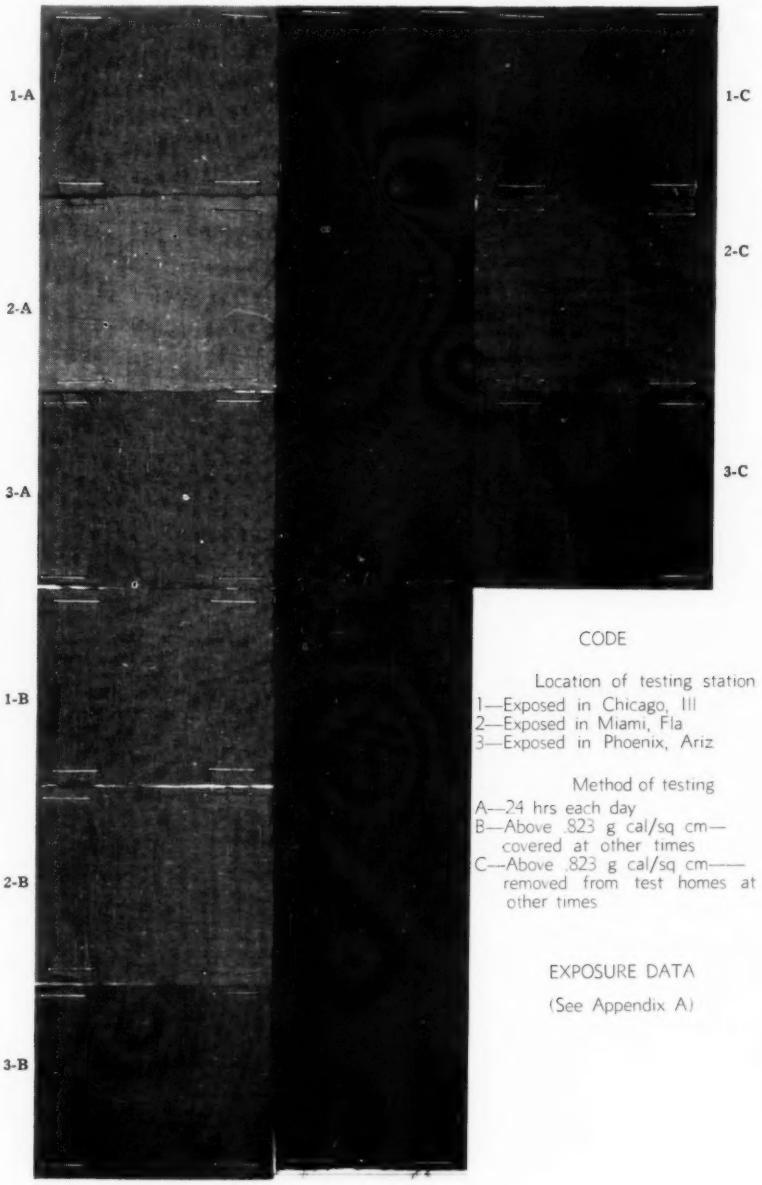
The Committee issued its first progress report in April, 1956. With a new series of tests now nearing completion, it hopes to prepare a final summation in the months to come. From the thousands of exposures, it has drawn some definite conclusions to the three major questions developed at the Detroit meeting. With the permission of the AATCC, I have brought along a few exhibits, some of which I will show as slides to help explain some of our findings. More photographs and explanations will be presented in the future in the complete paper being prepared by the Lightfastness Committee.

VARIATIONS IN SUNLIGHT TESTING———Sets of swatches from 24 dyeings on cotton, wool, viscose and nylon, three auto fabrics and six AATCC blue standards were exposed under glass in Chicago, Miami, and Phoenix by three methods:

A) 24 hours a day
B) 9 AM to 3 PM, then covered and left in test frames
C) 9 AM to 3 PM, but removed from frames between 3 PM and 9 AM.

Tests were run for 45 "sun hours," the term used by test stations and based on a mysterious formula of what constitutes a sun hour, and the equally strange opinion that there is no significant fading below the so-called threshold level of .823 grams calories per square centimeter. Tests were run each month for five months —July to December 1955. In August they were exposed for 60 sun hours.

The results of these six series of tests showed *very wide variations as to results in three locations, by three methods, and at different months of the year, and clearly indicated the basic error of using "sun hours" as a measurement of quality, instead of the AATCC Blue Standards.*




ORIGINAL

**Figure 9**
**2.0% Direct Blue 6G (*CI* 432)—45 sun hrs**

Figure 9 shows the results on cotton fabric dyed with 2.0% Direct Blue 6G (*CI* 432), Figure 10 shows results on cotton fabric dyed with 1.0% Direct Pink 2BL (*CI* 353), and Figure 11 shows results on a tan auto fabric. Exposure data are shown in the Appendix.

In another test (not illustrated), dyeings on cotton fabric with Pink 2BL (*CI* 353) showed a lower amount of fading in September tests as compared with the previous ones made in July.

It was also noted that, in one location, there was less fading on many samples in 60 hours in August than was shown on the same swatches in 45 hours three weeks earlier in July.

The reasons for the above variations are the following:

A) Rating of color fastness in terms of sun hours is wrong, because a sun hour, under present interpretations, is extremely variable, being any hour during which the Langleys exceed .823 grams calories per square centimeter per minute, or 49.38 total for

B) Commercial testing stations are not equipped at present to exclude all radiation or Langleys *below* the .823 levels from impinging on the samples, except when and where sunlight intensity is steady and not continuously interrupted by cloud conditions. Therefore, samples are exposed to many Langleys below .823, which are not included in the computation to make up the so-called sun hour. As fading is closely related to the number of Langleys, it stands to reason that a "sun hour" of 50 Langleys will not cause the fading of a sun hour of 70 or 80, based on the present system of calculating a sun hour. Under these conditions, good reproducibility at one or different stations is impossible, without lengthening the test period to allow for only putting out the samples when one is assured of continuous high intensity.

EFFECT OF LOW SOLAR INTENSITY ON COLORFASTNESS ———The next series of tests proved the fallacy of the opinion that dyes show no significant fading below the erythemal level of .823 grams calories per square centimeter.

All 33 sets of swatches were exposed in automatically shuttered cabinets so that one of each could be exposed to a given number of Langleys at particular levels, ie, .1 — .4; .4 — .6. .6 — .823 and above vs the 24-hour daylight method as well as the 9 AM — 3 PM sun test. Figure 12 shows the results of the test on green Auto fabric.

Exposure at the lowest levels at .1 or just after sunrise and at the other levels below .823 show very similar fading at levels above .823. On the other hand, this series is leading to an explanation to the abnormal fading noticed on certain dyes on cotton.

With Blue 6G (Pr 432) on cotton, we note that long exposure at the lowest levels of intensity, when moisture presence is greater, does show up in increased fading of this dye, and Pink 2BL (*CI* 353) on cotton. Tests at .1 — .4 grams calories required 669 clock hours to accumulate 1500 Langley units on this dye, whereas in good sunshine, .823 grams calories and above needed only 193 clock hours. In other words, this is another dye which fades more at low levels of intensity because of excess moisture or *other factors still unknown.*

Red 6BL (Pr 428) is a faster red on cotton, exposed under the same six conditions as the pink but for 2500 Langleys. Fading at all levels is practically the same, unlike the two previously mentioned moisture-sensitive dyes. Our Langley studies have

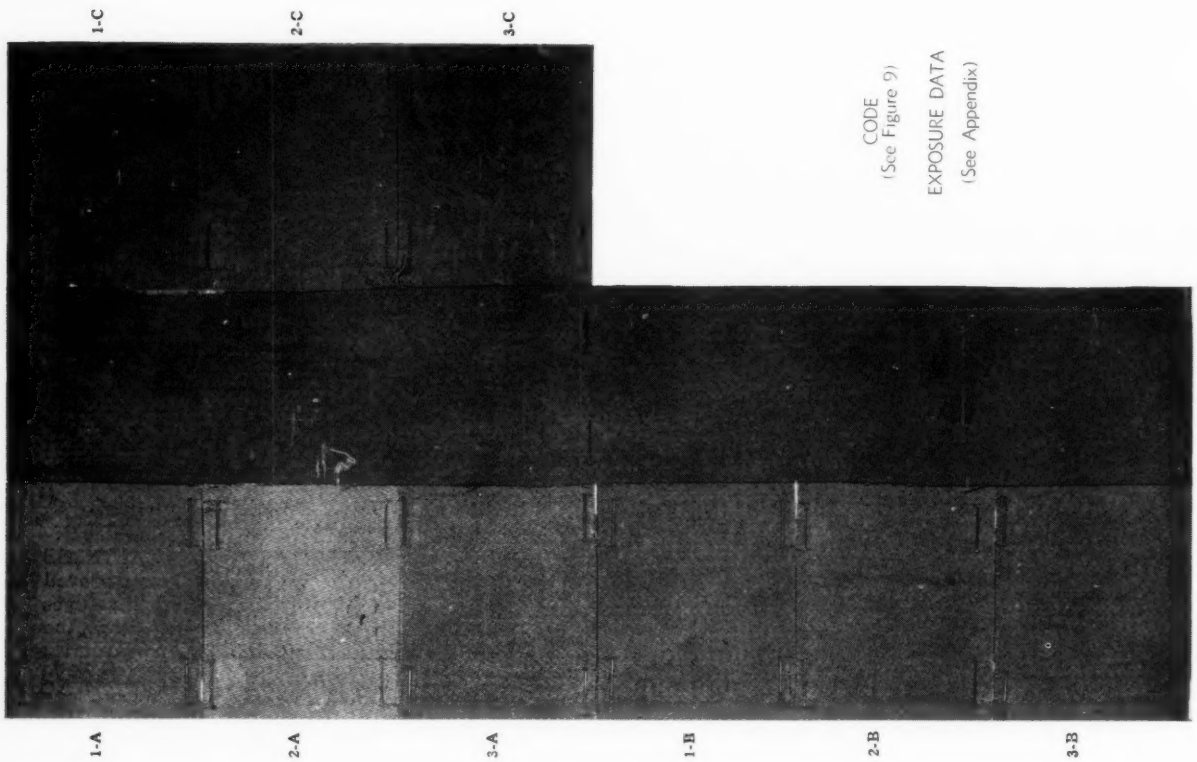



Figure 11

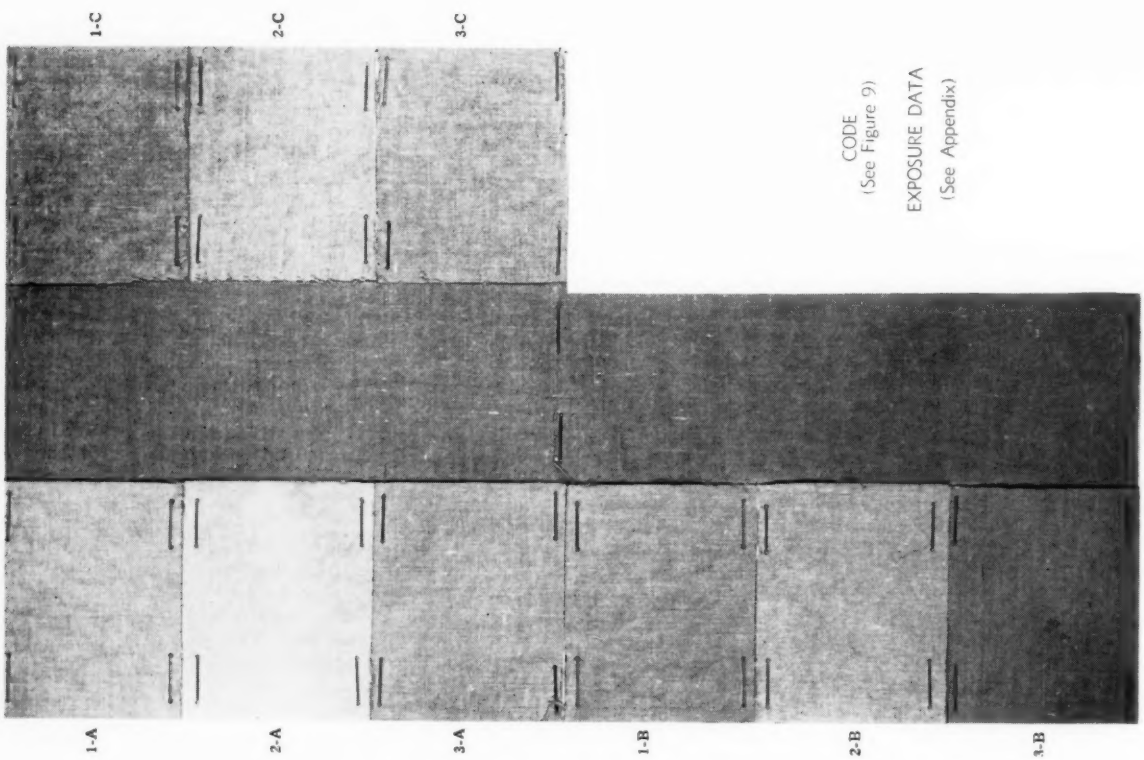
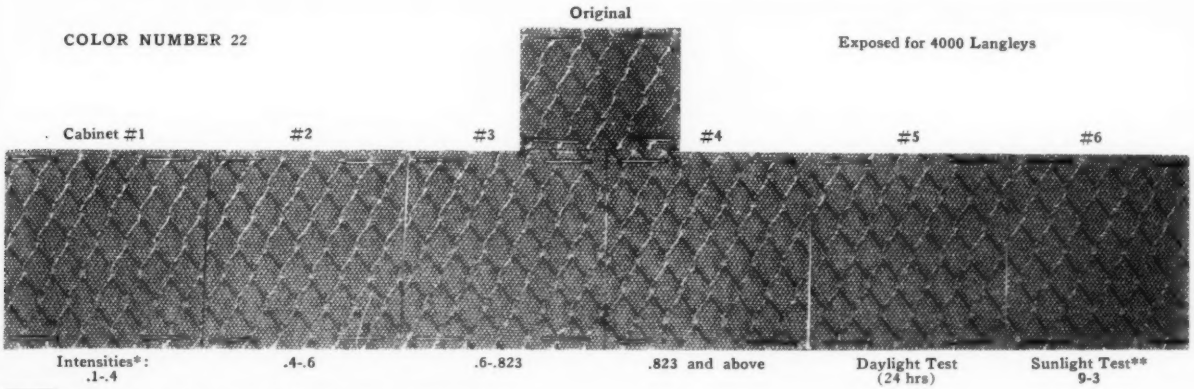



Figure 10
1.0% Direct Pink 2BL (C.I. 353)— 45 sun hrs




* Intensities measured in grams calories per square centimeter.
**Sample #6 removed from cabinet 3.00 pm—9.00 am.
All others left in cabinets for entire test period.
#1-#4 exposures controlled by automatic shutters.
Tests conducted April-July 1956 depending on length of exposure.

**Figure 12**
**Green Auto Fabric**

brought out these variables and may lead to a method or system of detecting and evaluating moisture-sensitive dyed fabrics or dyes.

Cunliffe (*2*) and McLaren (*3*) have been carrying on some interesting studies regarding the effect of moisture on lightfastness. Here in the United States, the Mid-West Section of the AATCC in its 1953 Intersectional Contest Paper (*4*) pointed out that ". . . in general, all the dyed fibers were affected much more by increases in temperature than they were by increases in relative humidity." Seibert (*5*) in his work (unpublished to date) confirms the work of the Mid-West group both in the Fade-Ometer and in sun and daylight. In other words, there are wide differences of opinion on the moisture question.

As further proof that fading takes place at levels below .823, here is a test of two swatches on cotton and two on wool. One of each fabric was exposed for three days during complete sunshine. The others were exposed north with no direct sunshine striking the samples. In the tests facing north, the amount of UV and reflected solar intensity was too low to register, but by exposing the cotton swatches for 25 days and the wool samples for 19 days, we approximated the fading of the three day sun-tested samples.

LANGLEY UNIT METHOD OF TESTING———Our recent studies of sun testing were on a basis of Langleys, rather than hours. Tests on the same 33 swatches as used in other tests were run for equal number of Langleys in Miami and Phoenix by the standard AATCC sunlight method and by a continuous 24-hour test.

With Pink 2BL (*CI* 353) on cotton, we obtained excellent duplication of results in both locations and by both methods.

Previous tests showed that nylon, like many synthetic fibers, showed more chance for excessive fading under combined high temperature and humidity. On testing Brill Alizarine Sky Blue 2GS (S) on nylon (3000 Langleys) by either method in the dry climate of Phoenix or the higher humidity of Miami, we obtained excellent duplication of results by both sun and daylight methods. With Lanasyn Brown RL (S) on nylon (4000 Langleys; approx 100 hrs in the Fade-Ometer) the four exposures were again very similar.

A test on Blue Standard L-4, like all other standards (L-2 to L-8) shows excellent duplication in the four tests. (At 4000 Langleys we obtained a fading equal to step 3 on the grey scale).

A new series of tests are now nearing completion and represent a checking of these earlier Langley tests, at a different time of the year (six months later) as well as a testing of the Langley idea on 28 dyes on various synthetics. The new work was conducted at two Florida stations as well as in Phoenix and Chicago.

We have not said that the Langley is the final answer, but we see signs that it can be a means of developing a better test. We agree with the early findings of Cady and Appel (*6*) on the greater accuracy of a 9 AM — 3 PM test, but this is not practical all over the world. On the other hand, we do not agree with the opinions of others that because a daylight test is subject to moisture it is useless. We believe that our job is to develop a daylight test because that is the condition under which auto and other fabrics are used; that is, 24 hours a day, not just between 9 AM and 3 PM.

## SUMMARY

In closing, we wish to say that only through our constant contact with fabric makers and dyers can we keep up with your requirements. The development of new dyes and fixing compounds is not done overnight, and for this reason, gentlemen, we ask that you keep us well informed as to trends in design and color.

By the same token, the research groups in the AATCC should have the benefit of the experience of cloth maker, the dyer and the auto industry, and be kept informed as to problems concerned with test methods. Our prime object is to develop test methods which will properly predict the fastness of the material to the satisfaction of both the producer of the fabric, the auto maker, and the ultimate consumer. The study on light-testing methods touched on tonight is one of many examples of how we are trying to serve both ends of the textile industry.

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(*3*) McLaren, K, *J Soc Dyers Col* **70** (1954).
(*4*) Mid-West Section, AATCC, *Am Dyestuff Reptr* **43**, P497 (1954).
(*5*) Seibert, C A, AATCC research associate. Unpublished report.
(*6*) Cady, W H and Appel, W, *Am Dyestuff Reptr* **18**, 407-46 (1929).

Original
Figure 11

Original
Figure 10
1.0% Direct Pink 2BL (*CI* 353)— 45 sun hrs

## APPENDIX

Exposure data (see Figs 9, 10, and 11)
Tests made in July 1955 (Series I)

| | Test Stn #1 | Test Stn #2 | Test Stn #3 |
|---|---|---|---|
| *Method A* | | | |
| Sun hours | 45 | 45 | 45 |
| Daylight hrs (sunrise-sunset) | 187 | 302 | 170 |
| Clock hrs | 386 | | 244 |
| Langleys above .823* | 2579 | 2961 | 3007 |
| Langleys below .823* | 3522 | 2806 | 1547 |
| Total Langleys | 6102 | 5767 | 4549 |
| Ratio of total L's #2–#3 | | 126 to 100 | |
| *Method B* | | | |
| Sun hours | 45 | 45 | 45 |
| Daylight hrs (sunrise-sunset) | 84.4 | 121.1 | 45.0 |
| Clock hrs | 84.4 | | 46.2 |
| Langleys above .823* | 2716 | 2961 | 3020 |
| Langleys below .823* | 1569 | 1126 | 7 |
| Total Langleys | 4285 | 4087 | 3027 |
| Ratio of total L's #2–#3 | | 138 to 100 | |
| *Average temperature and relative humidity test period* | | | |
| Avg Black Panel temp at level of tests | 126°F | 115°F | 153°F |
| Exterior ambient temp | | | |
| Avg high during test period | 87° −F | 87° −F | 105°F |
| Avg low during test period | 84°F | 76° +F | 73.8°F |
| Relative % humidity | | | |
| Avg from 4 daily readings (during test period) | 62% | 79% | 51% |

*Refers to gram calories per square centimeter.
*Note:* All tests made under glass.

# MEMBERSHIP APPLICATIONS

SENIOR

**Jack Bools**—Dyehouse lab, Dixie Mercerizing Co, Chattanooga, Tenn. Sponsors: W G Agnew, O L Masinbill. (SC).

**Arthur B Brooks**—Gen mgr, secy-treas, Post Narrow Fabrics Co, Andover, Conn. Sponsors: J E Hirn, W D Lowell, (RI).

**Hugh G Bryce**—Head, Prod Develop Lab, Fluorochemicals Div, Minnesota Mining & Mfg Co, St Paul, Minn. Sponsors: P B Stam, J G Stass. (MW).

**Mario E Corna**—Supt, Fnish Dept, Societa Commerciale Bossi, Cameri, Italy. Sponsors: O Bizioli, A Bolgiani.

**Samuel D Dadisman**—Asst mgr, Finish Div, The Jefferson Mills, Jefferson, Ga. Sponsors: R W Cobb, W B Amos. (S).

**Ernest A Dolliver**—Chemist, Allentown Converting Co, Allentown, Pa. Sponsors: E F Bohl, V C McCollom. (DV).

**Frank J Holanik**—Textile chemist & dyeroom foreman, Joanna-Western Mills Co, Chicago, Ill. Sponsors: L B MacFarland, F F Beverly. (MW).

**Fred R Jaeckel**—Plant supt, Normandie Press, Inc, Normandie Cloth Label Co, Inc. Sponsors: R H Stutz, M Winkler. (NY).

**Edward C Lafferty**—Salesman, N E repres, Milligan & Higgins Corp, New York, NY. Sponsors: E B Bell, L E Rossiter. (NNE).

**Pat J Maselli**—Dyer & finisher, Ribbon Fabric Co of Cuba, Havana, Cuba. Sponsors: C J McLaughlin, A R Connor.

**Koji Matsui**—Chief of Dyeing Section, Dai Nippon Spinning Co, Osaka, Japan. Sponsors. M Matsui, T Miyaji.

**William H Petersen**—Chem eng, Minnesota Mining & Mfg Co, St Paul, Minn. Sponsors: T Peel, F H Towey. (MW).

**E Jean Phillips**—Dye Dept Lab supv, Dixie Mercerizing Co, Chattanooga, Tenn. Sponsors. O L Massingill, W G Agnew. (SC).

**Carroll A Reddie, Jr**—President, Chemical Services, Inc, Atlanta, Ga. Sponsors: R W Jones, R L Smart, Jr. (S).

**Max Saltzman**—Develop supv, B F Goodrich Chemical Co, Hawthorne, NJ. Sponsors: P J Luck, W R Shaw. (NY).

**Peter M Wyrick**—Chemist, Mayfair Textile Plant, Burlington Industries, Inc, Burlington, NC. Sponsors: C Hooper, C M Clevenger. (P).

**John W Young**—Master dyer, Bigelow Sanford Carpet Co, Thompsonville, Conn. Sponsors: T E Lyons, W McGuigan. (WNE).

ASSOCIATE

**Danny Gayman**—Salesman, Ciba Co, Inc, Portland, Ore. (PN).

**William C Rusch**—Vice president, Acid Products Co, Inc, Chicago, Ill.

*(concluded on page P368)*

# Employment Register

*This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the secretary.*

### 57-8

*Education:* New Bedford Institute of Textiles & Technology, BS, textile chemistry.

*Experience:* 8 years, chemist-embossing dept; supt of bleaching, cotton & rayons.

*Age:* 27; married; references; veteran.

*Position desired:* Plant chemist or finisher.

*Location desired:* New England.

5-6, 5-20

### 57-9

BS, Chemical Engineering.

*Experience*: 20 years dye manufacturing—chief colorist; technical director; sales manager. All large firms. Excellent trade relationship.

*Age*: 46; married; references; resume on request.

*Position desired*: administrative—technical sales.

*Location desired*: open; now residing in Southeast.

5-20, 6-3

New York Section———

# RANDOM TUMBLE PILLING TESTER*

E M BAIRD, L C LEGERE and H E STANLEY
*Textile Fibers Department*
*E I du Pont de Nemours & Co, Inc*
*Wilmington, Del*

A new type of tester for pilling tendency is described in which apparel fabric specimens are tumbled inside a rubber-lined cylinder in the presence of a small amount of cotton lint. The fuzz and pills formed in this process correlate well both in amount and appearance with that formed during wear on garments from the same fabrics.

## INTRODUCTION

THE evaluation of the pilling propensity of various textile fabrics has become of increasing importance and a number of laboratories have developed instruments to measure this property. It is desirable that any test for pilling produce pills which correlate well with actual use performance, both with respect to the number and the appearance of the pills developed in the laboratory test. Furthermore, the test should be applicable to a wide variety of apparel fabrics without requiring changes in test conditions. If a test satisfies these requirements for a number of carefully wear-tested fabrics, it is reasonable to assume that the mechanism of pill formation is realistic, and a continuing satisfactory correlation between laboratory test results and actual use experience might be expected.

Since realism in appearance and structure of pills formed in the test was a primary objective in this work, it was felt that this goal could be most likely attained by a laboratory test which subjects the fabric to flexing and rubbing actions, such as a garment receives in normal wear. Multi-directional rubbing was considered to be preferable to the regular, repeated motions used in several available pilling testers.

In order to provide a laboratory test in which specimens are pilled in this manner, a new type of pilling tester, referred to here as the Random Tumble pilling tester, has been developed. It is the purpose of this paper to describe the construction and operation of this tester and to report the correlation of results obtained on it with wear test results.

## DESCRIPTION OF APPARATUS

The Accelerotor, an instrument developed by the American Association of Textile Chemists and Colorists, has been found useful in predicting end-use performance of fabrics, since it produces in the laboratory, appearance changes which are very close to many of the effects that occur in actual wear. In the descriptive literature furnished by the manufacturer (*1*), mention is made of the possibility that the tester might be used to measure the pilling tendency of fabrics. Tests with other devices such as a home-type tumble dryer have demonstrated that a random tumbling action when coupled with a much milder rate of abrasion than that obtained in the Accelerotor produced realistic pills. Our work indicates that by suitably modifying the Accelerotor and with a special technique, satisfactory pilling can be secured. We prefer, however, to use a unit that differs from the commercial Accelerotor in cylinder size, operating speed and impeller design; and which employs a nonabrasive lining material together with multiple specimens in one chamber. For greater testing capacity, we have found it convenient to use an instrument which includes six such

**Figure 1**
**Six-position Random Tumble pilling tester**

*Presented by A G Scroggie before the New York Section on October 19, 1956 at Kohler's Swiss Chalet, Rochelle Park, NJ. Reprinted with permission of *Textile Research Journal*, in which the paper appeared originally in September, 1956.
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units with a common drive and control.

The Random Tumble pilling tester developed in this laboratory is shown in Figure 1. Test specimens are caused to tumble freely in a cylindrical chamber (5.75 inches inside diameter by 6 inches in length) by the action of two 4.75-inches-long impellers equally spaced on a horizontal shaft at the axis of the cylinder and rotating at a speed of 1200 rpm. The inside wall of each cylinder is covered with a removable neoprene sheet packing liner approximately ⅛-inch thick, which leaves a clearance of about ⅜ inches between the end of the impeller and the liner surface. In the tumbling action, specimens are constantly flexed and abraded multidirectionally by being rubbed against the neoprene liner as well as against the other fabric specimens.

The liner material is a very important part of the apparatus since 1) its frictional properties determine the rate of pill formation, 2) its durability must be such that it exhibits minimum change in frictional properties with running times of several hours, 3) it must provide an easily reproducible surface since the reproducibility of the test is directly related to the liner surface, and 4) it must not introduce static or other extraneous variables. Neoprene N-50 (manufactured by the Hamilton Rubber Manufacturing Co, N J) is being used as the liner material at the present time.

## RANDOM TUMBLE PILLING TEST PROCEDURE

TEST SPECIMEN PREPARATION ——Test specimen size, within limits, is not critical insofar as the essential principles of the test are concerned. Small specimens—less than about three inches square—do not tumble satisfactorily, however, and specimens greater than about six inches square are sufficiently bulky to cause difficulty by wedging between the impeller and the liner surface. Single specimens five inches square were tested in each chamber throughout the early development of the test. Recent tests, however, have shown that as many as three specimens each four inches square can be tested satisfactorily in a single chamber as long as all three specimens are of the same fabric. Exploratory tests in which specimens of dissimilar fabrics were tested in a single chamber revealed that strong interactions may occur under these conditions, resulting in nonreproducible results as a given fabric is tested with a series of different fabrics. Testing of multiple specimens in a single chamber is considered desirable because 1) a greater amount of fabric-on-fabric rubbing is obtained during a test than is the case with a single specimen, and this is considered by some to be highly desirable, 2) the capacity of the tester is effectively increased (thereby permitting more specimens to be evaluated), and 3) the presence of more than one specimen in a chamber assists in maintaining specimen agitation.

In preparing fabrics for testing, four-inch square specimens are cut at a 45° bias from the fabric, and each edge is sealed with a light application of Duco cement, which has been diluted with acetone (2 parts Duco cement with 5 parts acetone). Sealing of the specimen edges is necessary in order to prevent them from becoming frayed and entangled with the impeller shaft during the tumble testing.

PREPARATION OF LINERS—— In order to provide a liner surface which can be easily reproduced on new material, as well as on liners which have begun to show wear with prolonged use, liners are sanded with a vibrating sander using 4/0 garnet paper until a uniform matte surface is obtained. After 30 minutes of use on each side, it is necessary to clean the liners by a vigorous scrubbing. During early development of the test it was found that a brisk hand scrubbing with a stiff brush and scouring powder was sufficient to provide an acceptably reproducible liner surface. The time required for hand scrubbing, however, is prohibitive when a large number of tests are being run, and we have found that acceptably reproducible liner surfaces can be obtained when they are placed in individual nylon mesh bags and agitated in a domestic-type washing machine for 15 minutes, followed by drying in a tumble dryer. Liners are conditioned at standard testing conditions of 65% RH, 70° F before being used for tests.

Periodically the liners are resurfaced by sanding. When "fugitive" finishes such as improperly cured silicone resins have been used, the finish may be transferred from the specimens to the liners during tumbling. This is evidenced by a slick, shiny appearance which accompanies a change in surface properties; the latter may occasionally be great enough to give low results and in such cases must be followed by sanding after each use. Other methods of cleaning liners after each test to reduce or eliminate the need for periodic sanding are being evaluated currently.

ADDITION OF LOOSE FIBERS TO TEST CHAMBERS——As mentioned previously, a primary objective in the development of the Random Tumble pilling tester was to produce pills similar in appearance and structure to pills formed in wear. While it was found early in the development of this test that the expected *number* of pills could be formed on a test specimen by the Random Tumble technique, the pills were invariably small, tight, and generally unrealistic in appearance. Variations in test conditions of time, speed, and linear materials failed to correct this difficulty.

It was discovered, however, that the inclusion of a small amount of short length cotton fiber ("lint") in each test chamber during the test run produced very realistic pills. The cotton fibers became entangled in pills as they were formed during the course of a 30- to 60-minute test run, producing typical large, "lint" pills which were essentially identical to pills formed on garments in normal wear. It has been repeatedly demonstrated that the inclusion of cotton lint in the test chamber will not cause pills to form on a specimen which would otherwise be free of pills; the cotton lint contributes only to the formation of large, more realistic pills.

Random Tumble pilling tests in which different fibers, including cotton, nylon, Orlon acrylic fiber, Dacron polyester fiber, rayon or wool, were added as the loose fiber component revealed that cotton is by far the greatest contributor to the formation of lint pills. Dacron was found to cause slight lint pilling, while nylon, Orlon, and wool caused negligible lint pilling.

The quality and length of the added cotton fibers affect the appearance, but not the number, of test pills. It has been determined by subjective evaluation of test specimens pilled in the presence of various amounts of cotton of various lengths that satisfactory results can be obtained with the present test conditions by adding to each chamber 50 milligrams of 0.2-inch-long cotton fibers. While the presence of this quantity of cotton is required to permit formation of pills of realistic appearance, it should be noted that only a small fraction of the available cotton is actually entangled in pills.

Examination of a large number of garments which had been pilled in wear confirmed the importance of the role played by foreign fibers, primarily cotton, in the formation of large, objectionable-looking pills. The presence of cotton in pills was con-

firmed by examining garments under an ultraviolet light in a dark room. Under these conditions cotton fibers which had been exposed to detergents containing optical brighteners (this includes most of the cotton in wearing apparel) were readily detectable by their brilliant fluorescence. Also, the presence of cotton in the majority of pills formed in wear has been confirmed microscopically.

OPERATING CONDITIONS CURRENTLY USED———At the present stage of development of the Random Tumble pilling test, our preferred conditions consist of tumbling three replicate specimens for 60 minutes at an impeller speed of 1200 rpm in a chamber lined with a sanded and washed neoprene liner and containing 50 mgs of 0.2-inch-long cotton fibers. In order to randomize small differences between liner surfaces, test specimens are removed after 30 minutes of tumbling and the liners are turned over so as to provide a "fresh" side for the remaining 30 minutes of a test. At the completion of 60 minutes tumbling, specimens are removed from the test chambers and subjected to a thorough vacuum cleaning to remove excess lint or loosely attached pills.

The same test conditions are used for all tests of apparel fabrics regardless of fiber type or fabric construction.

EVALUATION OF TEST SPECIMENS———Pilling test specimens may be evaluated by subjective comparison with standard specimens or photographs of such specimens, or they may be subjected to pill counts with the results being reported as pills per unit area. Pill counting was used to evaluate specimens during the development of the Random Tumble pilling tester because of somewhat greater resolution in detecting the effect of test variables on severity of pilling. Our experience indicates, however, that pilling of a fabric in wear should not be judged merely by the number of pills since other factors, including the size of the pills, the degree of color contrast between pills and fabric, and the amount of fuzz all contribute to the acceptability of the fabric. Also we have noted that there is likely to be a wide range of actual pill counts assigned to fabrics whose "acceptability" is about equal, and that fabrics of equivalent pill count may differ greatly in acceptability.

We accordingly have used a system for rating the over-all acceptability of samples which has proven quite reproducible and rapid in use. Comparison "standards" have been established for various fabric types including tropicals, gabardines, worsted flannels, mill-finished worsteds, knit fabrics and shirtings. In each fabric series pilled specimens have been chosen to represent characteristic examples of: 1) no pilling, 2) slight but tolerable pilling, 3) moderate pilling, of borderline acceptability, 4) unacceptable pilling, and 5) extremely high pilling. The level of pilling at the various numerical ratings has been chosen to correspond to a similar rating system used by our field testing group in evaluating wear test garments. Figure 2 shows a set of standards for gabardine suitings.

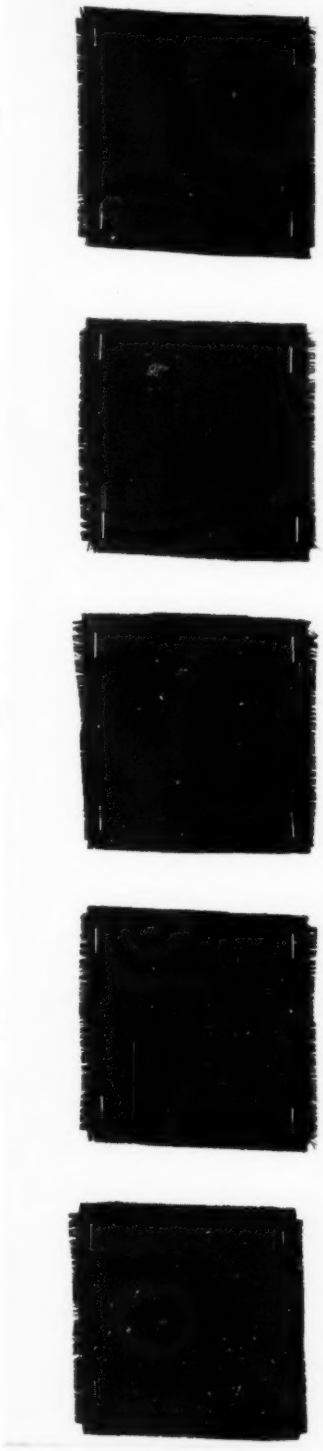


**Figure 2**
**Fabric standards of gabardine suitings showing scale of pilling acceptability ratings**

Test specimens are evaluated by assigning to them a numerical rating of 1 to 5, which indicates their over-all pilling in comparison with the standards. Intermediate values, such as 1.5, are used to indicate a level of pilling falling between two of the established standards. The average rating of at least three specimens, and generally six or nine specimens reported by two evaluators, is used as a basis for predicting the expected performance of a fabric in wear. The degree of correlation between laboratory tests and wear tests is discussed below.

## DISCUSSION OF RESULTS

WEAR TEST PILLING DATA———Samples of fabrics were collected which had previously been wear tested in statistically designed field experiments. These fabrics included a wide range of different weaves, fiber types, and fiber blends: ie, gabardines, mill-finished worsteds, woolen flannels, tropicals, shirtings and knit materials. The evaluation of worn garments for pilling performance was carried out using the subjective pilling acceptability ratings discussed in the previous section. We feel that the variety of fabric types, fiber types (and blends), and the range of pilling exhibited by these fabrics in wear is sufficient to establish with a high degree of reliability, the correlation between laboratory test pilling, and pilling in wear.

CORRELATION BETWEEN LABORATORY AND TEST RESULTS———Fabrics which pill in wear will generally show a considerable range of pilling, depending in part upon the nature and activity of the person wearing the garment; some garments will show relatively few pills and others many pills. It is theoretically possible, therefore, to establish laboratory test conditions such that test results can be used to predict either

the over-all average pilling of a given fabric in wear, or the pilling to be expected in the high or low ranges of the wear pilling distribution observed for that fabric. In order to be on the conservative side in estimating a fabric's pilling propensity, it is desirable to have a test which will predict the pilling to be expected from the more severe wearers. The Random Tumble pilling test, when used as described above, has been found to correlate with the average pilling exhibited by wearers falling above the median. We have chosen to designate this value as the "upper half mean." Figure 3 shows the relation between wear pilling ratings of the upper half mean at 300 hours of wear, and 60-minute random tumble pilling test ratings. Each of the 30 points in Figure 3 represents a different fabric. The plot includes six knit sweater fabrics, two tropicals, five gabardines, five mill-finished worsteds, two flannels, and ten shirtings (pilling only on the body of the shirts was considered in establishing correlation). The correlation coefficient for this data is 0.96, which is significant for 99% probability. A regression coefficient of unity indicates a 1:1 quantitative relationship between Random Tumble test pilling and the upper half mean at 300 hours wear. Additional data on several of the fabrics indicates a similar relationship between results secured in laboratory tests lasting 120 minutes and the upper half mean after 600 hours of wear.

The relationship between testing time and wearing time has not been completely investigated for the full series of fabrics used in obtaining the data reported in Figure 3. A previous regression analysis, in which only 13 fabrics were used, indicated that a linear relationship between testing time and wearing time might be expected.

In addition to the high quantitative correlation between laboratory test pilling and pilling in wear, we continue to find satisfactory agreement between the surface appearance of random tumble test specimens and worn garments. This is not only true for pilling, but also for other changes in appearance, such as fuzzing, loss of cover, or "scuffing."

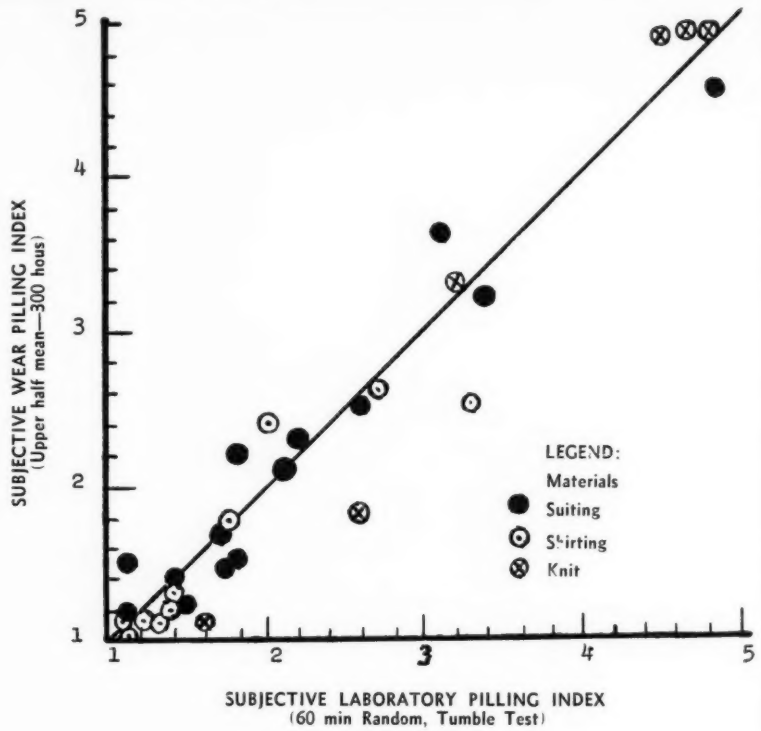


**Figure 3**
**Subjective laboratory pilling index correlated with subjective wear pilling index for suiting, knit and shirting fabrics. Coefficient of correlation, 5=0.96 (significant for 99% probability). Regression line equation, y=x.**

## CONCLUSIONS

The Random Tumble pilling tester is a useful tool to predict in the laboratory the relative pilling performance of a fabric in wear. The primary advantages of the tester are: 1) a high degree of correlation between laboratory pilling and pilling for 300 hours or more of wear, for a complete range of fabric types, and for a wide range of pilling, 2) pills formed on test specimens are similar in appearance and structure to pills formed in normal wear, even to the point of forming true "lint" pills, 3) all specimens are tested under the same test conditions regardless of fiber type or fabric construction, and 4) the use of a multiposition tester provides sufficient capacity to handle the desired number of replicates in a reasonable time.

## ACKNOWLEDGMENTS

The encouragement and assistance of Drs R M Hoffman and A G Scroggie are gratefully acknowledged. Appreciation is expressed to E E Culpeper for carrying out the wear tests.

## REFERENCE

(1) Trade publication dated July 1954 of Atlas Electric Devices Co, Chicago, Ill, manufacturers of the Accelerotor. The Accelerotor is covered by U S Pat 2,749,740, issued to H W Stiegler.

## Membership Applications—

*(concluded from page P364)*

***Associate***

**Charles E Watkins, Jr**—Sales repres, Chemical Div, Celanese Corp of America, Charlotte, NC. (P).

STUDENT

**Chris Kapetanakis**—Lowell Tech Inst. Sponsor: G R Griffin.

**Myung S Chun**—Georgia Inst of Technology. Sponsor: W Postman.

**Irene Davenport**—Georgia Inst of Technology. Sponsor: W Postman.

**Martha C Moss**—Georgia Inst of Technology. Sponsor: W Postman.

**Stother E Murdoch, Jr**—Georgia Inst of Technology. Sponsor: W Postman.

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

**David H Abrahams, Robert D Fawcett, Ernest J Finan, Leo E Labrecque, Thomas H Randall.**

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It is presumed that authors in studying the comments of reviewers and of the Editor will remember that all recommendations are made in a kindly, helpful, sympathetic manner to improve the paper in both literary and technical excellence. Although authors should cheerfully consider suggestions, they are expected to defend their position if justified, especially when strictly technical matters are involved with which the authors have an intimate knowledge.

AATCC strives to maintain a high scientific and professional standard for papers. Authors must make every effort to avoid the use of trade names, commercial products or process names wherever such use may be construed as advertising. Wherever possible, scientific nomenclature must be employed. It is recognized that in some instances trade names are necessary to avoid lengthy description. Certain trade names have been so widely used as to become generic and these normally are permissible. Further, some technical papers may involve the presentation of a new product or process wherein trade name reference is obligatory.

Giving due consideration to such valid exceptions, it is incumbent upon the author to maintain the proper scientific attitude, avoiding any expressions or devices aimed at promoting a particular product or process.

Questionable papers are to be referred to the chairman of the Publications Committee, who will submit them to an editorial board which would be appointed as needed. The Board would report to the Publications Committee, which would have the final voice in accepting or rejecting a paper.

MANUSCRIPTS — Manuscripts shall be typewritten double-spaced with approximately one-inch margins on 8.5x11-inch white paper. In addition to the *original*, at least one carbon copy is required. Pages are to be numbered consecutively with Arabic numerals, and each page after the first shall carry the authorship at the very top. Tables and figures shall also be numbered consecutively, the tables with headings containing Roman numerals as TABLE I, TABLE II, etc, and the figures with Arabic numerals as Figure 1, Figure 2, etc, appearing *below* the figures. The names of the authors and their laboratories or business connections should appear below the title of the paper.

LITERARY STYLE AND FORM OF PRESENTATION—In the writing of papers, authors are requested to observe a trenchant, simple style of writing directed to textile chemists and colorists with at least an elementary knowledge of chemistry, physics, mathematics, engineering, textile processes and textile machinery.

In the organization of the material, there should be one or more introductory paragraphs setting forth the occasion, significance and main objectives of the paper and of the method of attack. This should be followed by the body of the presentation, either with discussions interspersed throughout this portion or with a collected section marked "DISCUSSION" after the main body of the paper. Finally, there may be a brief section at the end entitled "SUMMARY" or "CONCLUSIONS."

Center and side headings make for easier reading. Center headings should be employed sparingly and generally will include only very important section headings, such as "INTRODUCTION," "EXPERIMENTAL," "DISCUSSION," "CONCLUSIONS," "SUMMARY," and "REFERENCES." Side headings (see sixth paragraph of this *Notice* for an example) shall be indented and run into the text to which they apply, and shall be separated from the paragraph by a dash. The publisher will print center headings in bold-face capitals and side headings in capitals.

LITERATURE REFERENCES AND FOOTNOTES—References to the literature and all footnotes (except those in tables) shall be numbered consecutively with underlined Arabic numerals in parentheses at the proper place in the text. Where a reference or footnote is to be used again, the original number is simply repeated; this obviates the necessity of repeating the footnote or reference at the bottom of the page. References to the literature shall conform to the universal usages followed by *Chemical Abstracts*, which include underlining of journal names to indicate italicization in printing. The abbreviated codes for many journal names appear on page 143 of the 1956 *Year Book*.

The spelling and rules of punctuation followed in manuscripts shall be those found in the "Merriam-Webster New International Dictionary"; abbreviations and chemical formulas shall conform to *Chemical Abstracts*.

FIGURE AND GRAPHS—Figures and graphs should be black line drawings on white drawing paper. Photographic prints are acceptable, preferably glossy prints on double-weight paper. Duplicates should be available for dispatch to reviewers. In graphs the frame and actual curves should be inked more heavily than the co-ordinate lines, and these latter should not be too close together. Various styles of broken lines are sometimes desirable to distinguish curves. Experimental points should be given with small plane figures, such as circles, squares, diamonds or triangles. Numbers and legends on co-ordinate axes are to be lettered in the graph by the author. Numbers and titles of figures should be placed below the diagram or on the edge of the back. Each piece of illustration copy should bear on the margin or on the edge of the back the name of the author and the title of the paper.

SYNOPSIS—A separately written synopsis of not over 200 words containing the gist of the subject matter must accompany every manuscript.

GALLEY PROOFS—Galley proofs will be sent to the author by the publisher for correction before publication.

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# Activities of the Local Sections

## Mid-West

THE 1957 Spring Meeting of the Mid-West Section was held at the Netherland-Hilton Hotel, Cincinnati, Ohio, on April 27.

Approximately 77 members and guests attended the afternoon technical session, at which John T Taylor, New Products Div, Rohm & Haas Co, Philadelphia, Pa, spoke on "Manufacture of Nonwoven Fabrics."

At the afternoon business meeting, Jack G Kelley, vice chairman, announced the recent passing of Clifford Jones, a member of the Section for many years. Mr Kelley also announced that Victor Braun, Jr, had again been awarded the Section's annual scholarship.

A Nominating Committee, which will present a slate of officers at the Fall Meeting, was named as follows: John Eich, *chairman;* J Gordon Stott, Thomas Spanley and Charles Sillen.

Elliott Morrill, AATCC vice president (Western Region), spoke briefly on the activities of the national association.

James F Whalen, outing chairman, outlined plans for the forthcoming 25th Annual Outing of the Section, which will be held June 14-15 at Browns Lake Resort, Burlington, Wis.

Prior to dinner, members and guests of the Section were invited to attend a reception at the joint invitation of Toms River-Cincinnati Chemical Corp and the Hilton-Davis Chemical Co.

Eighty-one members and guests were present for dinner, following which Norman R S Hollies, Harris Research Laboratories, Inc, Washington, DC, spoke on "Comfort in Clothing."

## Niagara Frontier

ON April 5, 1957, the Niagara Frontier Section of the AATCC held a joint meeting with the Ontario Section, CATCC, and the Western Division of the Textile Society of Canada in Kitchener, Ont, Canada.

Guy S Halliwell, Samuel Pegg & Sons, Leicester, England, presented a film and discussed the high-temperature dyeing and drying of Terylene and worsted tops using Pegg dyeing and drying equipment.

At the close of the meeting, a buffet was served by Doon Twines Ltd of Canada, hosts for the evening.

## Hudson-Mohawk

THE Hudson-Mohawk Section met March 29, 1957 at the Chelsea House, Tribes Hill, NY, with 62 members and guests present.

Leonard Shapiro, Borden Co Chemical Division, spoke on "Recent Developments in Emulsion Polymers for Woven and Nonwoven Textiles". The chemistry and technology of emulsion polymerization was described, and applications of the various emulsion polymers that are available commercially were discussed.

The Section will hold its annual Ladies Night meeting at Schuyler Meadows, Albany, NY, on June 21st.

## Delaware Valley

THE Annual Outing of the Delaware Valley Section will be held this Friday (May 24) at Torresdale-Frankford Country Club, Grant and Frankford Avenues, Philadelphia, Pa, under the chairmanship of A E Raimo.

A complete program of golf, putting, cards, darts, quoits, and other entertainment is scheduled.

## Southeastern

The Southeastern Section held its second meeting of the year at Lindale, Ga., on April 13th, with Ralph Champion, overseer of dyeing, Pepperell Mfg Co, Lindale, Ga, in charge.

At the technical session, Bernard K Easton, manager, Technical Research & Development Dept, Becco Chemical Div, Food Machinery & Chemical Corp, spoke on "Modern Bleaching with Hydrogen Peroxide."

Following Mr Easton's talk, Nelson S Knaggs, vice president, Hilton-Davis Chemical Co, narrated his recently completed film, "Nepal-Kingdom in the Sky."

During the business meeting, H Gillespie Smith, American Cyanamid Co, AATCC vice president, Southern Region, read to members a letter from James W Swiney, Southeastern Section chairman, reqesting that he be allowed to resign because of the fact that he has accepted a new position as vice president of Bryant Finishing Co, Quignick, RI, which will take him away from Atlanta. Mr Smith then announced that the Section officers had asked William B Griffin, vice chairman, to act as chairman during

# AATCC Calendar

COUNCIL
June 7 (Hotel Statler, New York)

NATIONAL CONVENTIONS
Nov 14-16, 1957 (Hotel Statler, Boston); Oct 30-Nov 2, 1958 (Hotel Conrad Hilton, Chicago); 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa.); September 28-30, 1961 (Buffalo, NY)

DELAWARE VALLEY SECTION
May 24 (Outing—Torresdale-Frankford Country Club, Philadelphia, Pa); Sept 27 (Joint meeting with New York Section at Hotel Hildebrecht, Trenton, NJ); Nov 1 (Sheraton Hotel, Philadelphia, Pa.); Dec 6 (Kugler's Restaurant, Philadelphia, Pa)

HUDSON-MOHAWK SECTION
June 21 (Outing—Antlers Country Club, Amsterdam, NY)

MID-WEST SECTION
June 14-15 (Outing—Brown's Lake Resort, Burlington, Wis); October 26, Bismarck Hotel, Chicago, Ill)

NIAGARA FRONTIER SECTION
June 21 (Annual Outing—St Catherines, Ont); Sept 27 (Buffalo); Oct 25 (Joint meeting with CATCC Ontario Section at St Catherines, Ont); Dec 6, Feb 21 (Buffalo); Apr 4 (Joint meeting)

NEW YORK SECTION
June 21 (Outing—North Jersey Country Club, Wayne Twsp. NJ); Sept 27 (Joint meeting with Delaware Valley Section at Hotel Hildebrecht, Trenton, NJ)

NORTHERN NEW ENGLAND SECTION
Sept 13 (Outing—Wachusett Country Club, W Boylston, Mass); Dec 6 (Annual meeting, Hotel Continental, Cambridge, Mass)

PIEDMONT SECTION
June 7-9 (Outing—Mayview Manor, Blowing Rock, NC); Sept 28 (Hotel Barringer Charlotte, NC)

RHODE ISLAND SECTION
June 14, (Outing—Warwick CC and Rocky Point, RI); Sept 27 (Ladies Night—Narragansett Hotel, Providence, RI); Oct 24 (Providence Engineering Society, Providence, RI); Dec 5 (Annual Meeting—Johnson's Hummocks Grill, Providence, RI)

SOUTH CENTRAL SECTION
June 21-22 (Outing—Lookout Mtn. Tenn); Sept. 20 (Hotel Patton, Chattanooga, Tenn)

SOUTHEASTERN SECTION
June 7-9 (Outing—Radium Springs Ga.); Sept 14 (Harmony Club, Columbus, Ga.); Dec 7 (Dinkler Plaza Hotel, Atlanta, Ga)

WESTERN NEW ENGLAND SECTION
June 14 (Outing—Wallingford, Conn); Sept 27 (Rapp's Restaurant, Shelton, Conn); Nov 1 (Annual meeting, Hartford, Conn, area); Dec 13 (Rapp's Restuarant, Shelton, Conn)

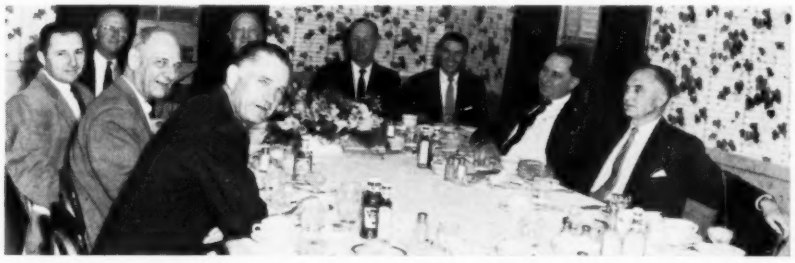
the balance of Mr Swiney's unexpired term.

Following a social hour at the Legion House, Lindale, a barbecue was served there to 102 attending members, guests and wives.

## PHOTOS TAKEN AT APRIL 13th MEETING OF THE SOUTHEASTERN SECTION

H Gillespie Smith reads letter from Chairman J M Swiney during business portion of April 13th meeting of the Southeastern Section. Seated at head table (l to r) are: Robert B Hallowell, Coats and Clark, Inc, national councilor; E R Ravenel, Morton Salt Co, secretary; and William B Griffin, Dexter Chemical Corp, vice chairman.

Bernard K Easton, Becco Chemical Div, FMC, conducts a demonstration during presentation of his talk, "Modern Bleaching with Hydrogen Peroxide".



Deciding the destinies of the Southeastern Section—(Clockwise around the table): J Elwood Barbre, Pepperell Mfg Co, sectional committeeman; E R Ravenel, Morton Salt Co, secretary; James Hall, F H Ross & Co; Gillespie Smith, American Cyanamid Co, vice president, AATCC (Southern Region); William B Griffin, Dexter Chemical Corp, vice chairman; George L Dozier, Southern Dyestuff Corp, sectional committeeman; Roy Smart, Olin Mathieson Chemical Corp; Ralph Champion, Jr, Pepperell Mfg Co, sectional committeeman; John C Cook, WRC Smith Publishing Co, publicity chairman.

Nelson S Knaggs, Hilton-Davis Chemical Co, narrates during the showing of his new movie on "Nepal—Kingdom in the Sky".

Barbecue. In foreground, Roger L Gill, Pepperell Mfg Co and Leslie L Bamburger, Lanett Bleachery & Dye Works.

Barbecue. Gustav von Metnitz, Adelaide Mills, chats with Dr and Mrs Paul V Seydel, Seydel-Wooley & Co. In background (hatless) is Hugh G Brown, Jr, Pepperell Mfg Co.

Social hour at the Legion House

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# Abstracts

## Pigment Padding Process

Clarke, J A, *Dyer* **117**, 29-32, January 4, 1957

In pigment padding the object is to take the color when it has no affinity and introduce it into very intimate contact with the fiber, and then, when it is in the right place, to bring it rapidly to a high state of affinity, and there to fix it without disturbing it.

The cloths which demand pigment padding are obviously those which are most difficult to penetrate with any liquor, or those for which the leuco vat dye has the greatest affinity, ie, tightly woven goods, mercerized cotton, and all types of linen.

The cloth should be well prepared, because it must be easily wetted, and it is desired to bring the pigment into intimate contact with the cellulose of the material. Thus, all size and dressing as well as the pectins and waxes must be removed. The cloth should then be dried evenly, preferably on a tenter frame. The author recommends that a rewetting agent be dried into the fabric.

The vat dye should be finely divided, and it is well to strain it to remove large particles. A dispersing agent should be added to the padding liquor. A temperature of 50-60° C-is recommended for the padding operation. The mangle box should be small, so that little liquor will remain in it at the end of the operation.

The author gives considerable detail on the best construction of the apparatus. He recommends a two-bowl mangle, large soft bowls, and maximum pressure.

If possible, the goods should be dried at this stage, preferably in a hot flue. The main effect of drying, before reducing on the jig, is to allow the caustic soda and hydrosulfite to be absorbed rapidly and to react quickly with the dye. This operation can also be speeded up by working at high temperatures or by increasing the strength of hydrosulfite in the bath. The author recommends a dyeing temperature of 75° C.—WHC

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## Studies on Permanent Creasing of Cotton Garments.

Reid, J D, *et al*, *Textile Research J* **27**, 252-9, March, 1957

The Southern Regional Research Laboratory has initiated work on the application of resin formulations to cotton garments for the express purpose of imparting permanent creases to them. The project has two phases: application to finished garments, and application to yard goods, with resin curing in each case being accomplished on the finished garment.

A reactant-type resin, such as dimethylol cyclic ethylene urea, compounded with an acrylic thermoplast, is said to give a satisfactory product for this purpose. The authors describe the preparation of the resin emulsion, which is padded on the cloth, dried, and cured at 180°C. It was found that an addition of at least 4% of resin by weight is necessary for good creases. Best results were obtained by curing from the wet state. An ordinary electric hand iron gave excellent curing and crease setting.

Lightly sized cotton accepted the treatment as well as desized material. Treated samples exhibited remarkable permanence of the finish, withstanding at least 12 simulated home launderings with excellent retention of creases. Samples suffered no discoloration or appreciable strength loss when subjected to the chlorine-retention test.

A description is given of the effect of a number of variables, such as the effect of storage on impregnated cloth, possibilities of stripping the resin, precautions in drying and curing, and the effect of catalysts.

Many factors influence the production of a satisfactory minimum care or wash-and-wear cotton fabric. These include weight and type of fabric, yarn size and twist, fabric geometry, mercerizing, etc. The authors studied the effect of the above resin treatment on a number of representative cotton fabrics. They found that heavier cloths require considerably longer curing times to obtain a good cure. They concluded that the production of permanent creases is practical in many types of cotton garments.

Nine references to the literature are cited.—WHC

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## A Preliminary Report on Fully Acetylated Cotton.

Buras, E M, Jr, *et al*, *Textile Research J* **27**, 214-22, March, 1957

Fully acetylated cotton (FA cotton), a chemically modified cellulosic fiber made from cotton and retaining its fibrous form, is described. The author gives details of a small-scale method of preparing a completely or nearly completely substituted product from cotton raw stock, yarn, or fabric by the application of acetic anhydride and perchloric acid catalyst in a diluent (amyl acetate) which minimizes the tendency of the product to dissolve. Its general properties and behavior in laboratory tests show it to have many superior properties to previously known cellulosic fibers, including partial acetates and triacetates.

FA cotton has good tenacity, both wet and dry, and flex-abrasion endurance; it has some thermoplasticity, yet shows no sticking at ironing temperatures below 250°C. It has low moisture regain, and is dyeable with ordinary acetate dyes. Work in progress indicates that treatment of yarn and fabric may be carried out satisfactorily in commercial-type stainless steel equipment.

Dyeing is conducted under the usual conditions, except that only a relatively short dyeing time is needed for exhaustion. The addition of o-phenylphenol as a carrier, and diammonium phosphate to maintain a pH of 8, is recommended. A full range of shades is obtainable.

This fully acetylated product has the desirable properties of resistance to heat and rot, and better abrasion resistance and tear strength than partially acetylated cotton, the preparation of which was described several years ago. The range of elastic properties which can be obtained by the combined application of heat and stress is considerable.

Although these evaluations have been conducted on a limited exploratory basis, collectively they give "exciting promise," according to the authors, of a chemically modified cotton that has many features which are sought in "new" fibers. Fifteen references to the literature are cited.—WHC

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## Epoxy Resins in the Creaseproofing of Cotton.

Schroeder, C W and Condo, F E, *Textile Research J* **27**, 135-45, February, 1957

The epoxy resins are an entirely new class of compounds for the creaseproofing of cotton unlike any other commercially available creaseproofing resin. The most outstanding feature of these resins is the fact that they are absolutely nonchlorine-retentive. The three features that

make them different from other resins are 1) the presence of an epoxide ring, 2) the absence of nitrogen, and 3) the absence of formaldehyde.

All of the well-known resins which impart a substantial degree of crease resistance do contain formaldehyde; therefore some have felt that the material used is merely a carrier for formaldehyde which is liberated to give the noted effects. The fact that epoxy resins do give crease resistance while they contain no formaldehyde should help to dispel this theory, the authors state. The absence of formaldehyde is also of practical value, in that odor development which may occur with nitrogen-formaldehyde resins cannot occur with epoxy resin-treated fabrics.

The epoxide ring, which is the chief characteristic of these resins, consists of two atoms of carbon united to one atom of oxygen. Of the numerous epoxy-containing compounds that have been synthesized, the one producing the highest crease recovery is being marketed under the name Eponite 100.

Catalysts ordinarily used with creaseproofing resins are not effective with the epoxy resins. Stronger catalysts, such as metallic fluoborates, perchlorates or sulfates, are required. Zinc fluoborate is particularly recommended.

The application of the resin to cotton fabric and its effect on tear and tensile strength, etc, are described.

The epoxy resins give a very durable finish, and treated fabrics retain substantially all of their crease resistance for the life of the garment. They are particularly suitable for white goods, which may be bleached and ironed repeatedly without loss in strength or scorching.

The chemistry of the epoxy group is discussed to show that epoxy-containing compounds react with alcohol groups, and to support the theory that cellulose cross-linking actually takes place.—WHC

## The Battle of the Fibers.

Anon, *Can Textile J* **74**, 31-2, February 22, 1957

"How are wool and cotton standing up to the competition of the man-made fibers? Is there room for them all to prosper in the future?" These are two questions of vital interest to both growers and users of the natural fibers, and they are closely bound up with a third question: "To what extent is the world increasing its annual rate of fiber consumption?"

The Food and Agriculture Organization of the United Nations in its latest fiber review furnishes some of the data to answer these questions.

World consumption of apparel fibers, according to this report, was 11.6 million metric tons in 1955, compared with 8.8 million in 1949, or an increase of more than 30 percent. During this period the world population grew only a little more than 10 percent.

As regards the individual fibers, the growth of rayon consumption is most marked; it increased from 1.1 million metric tons in 1948 to an estimated 2.3 million in 1956. The consumption of the man-made fibers increased from 68000 metric tons in 1950 to an estimated 300000 tons in 1956.

The percentage of total world consumption of the four main classes of fibers (cotton, woll, rayon, and the various man-made fibers) is given below for the years 1949 and 1955:

| | 1949 | 1955 |
|---|---|---|
| Cotton | 72 | 68 |
| Wool | 13 | 11 |
| Rayon | 15 | 19 |
| Man-made | — | 2 |

Wool appears to be holding its place in the world of fibers, the author concludes. Cotton is losing ground to rayon; in 1935-8 cotton took 80% of the market against 8% for rayon; now the figures are 68% for cotton and 19% for rayon.

The FAO report points out rather interestingly that North America uses twice as much cotton, wool and rayon per head as Western Europe.—WHC

## Man-made Fibers in the Carpet Trade: Dyeing of Staple and Yarns.

Cheetham, R C, *Dyer* **116**, 963-5, December 7, 1956

Rayon staple is being used on an increasing scale in floor coverings. In 1955, tufted carpeting sold in America constituted over 55 percent of total carpet sales, and it is estimated that about one-half of the yarn used in this field is rayon or rayon blend. It would appear that a vast and promising field exists for the development of man-made fibers in the carpet industry, provided the fiber or blend with the desired properties at the right price can be found.

The author suggests that a fiber like Fibrolane (made from casein), with its wool-like structure and properties as well as its smooth surface, is well equipped as a substitute for wool, and states that this fiber is now being used in blends for conventional Wilton and Axminster types of carpeting, as well as in the tufted variety.

Fibro (viscose rayon staple) differs fundamentally from wool, but because of its versatility it is already going far to meet the requirements of the carpet trade, both technological and economic. Acetate has a more limited application. Nylon has been used mainly to improve resistance to abrasion, and is sometimes included in blends up to about 10 percent.

Properties required of a carpet fiber are warmth, resilience, covering power, and satisfactory dyeing behavior (ie, the capability of being dyed in the full shade range in fast, level colors). The pile itself should be easily cleanable and have good resistance to wear and reasonable soil resistance.

Most of these requirements, the author believes, can be met by Fibro or Fibrolane. A tendency of Fibro to rapid soiling can be overcome by the use of anti-soiling agents, and its lack of resilience can be corrected by using crimped Fibro.

The dyeing of Fibro/wool and Fibro/Fibrolane blend yarns involves combinations of direct and premetallized acid dyes, applied together in the same bath.

Tufted carpets are piece-dyed, usually, but are also made from colored yarns. The author states that piece-dyeing seems to be preferred in the U S.—WHC

## Continuous Dyeing with Direct Dyestuffs.

Schmitz, A, *Can Textile J* **74**, 50-5, January 25, 1957

The author states that it is now possible to obtain all shades, including medium and dark, with direct dyes, completely fixed, by a continuous dyeing method. At the moment two different methods of continuous dyeing are available: the pad-steam process and the pad-roll process.

In all padding operations preliminary scouring of the goods plays an important part. In the color box of the padding machine the goods come into contact with the dye liquor for only a fraction of a second, and during this time every single fiber in the fabric must be penetrated completely. This is, of course, only possible if all impurities, including lubricants and sizes, are completely removed. Only scouring agents which impart good rewetting properties to the goods should be used for this purpose.

In the pad-steam process, the goods are first padded with the dyestuff solution, and this is followed by a steaming process in order to obtain diffusion of the dyestuff inside the fiber, and so to fix the dye. After the steaming process the dyed goods are finished on an open-width washer.

The author recommends a padding

*(concluded on page 376)*

# • PATENT DIGEST •

## PAUL WENGRAF

### WOOL DYED IN ONE-BATH CHROMING PROCESS——Nonionic Amine Derivatives Added C, 4, 06

USPat 2,763,529 (Ciba Ltd——Albrecht et al——Sept 18, 1956)

This patent, which describes a single-bath metallizing method for dyeing wool, refers not only to dyestuffs customarily used for one-bath chrome dyeing but especially to the application of dyes hitherto considered to be less suitable or unsuitable for this dyeing method. Metallizable *azo dyes of different groups* for use in the current method are enumerated.

It has been observed that the absorptive capacity of these dyes can be increased by incorporating in the dyebath nonionic surfactants prepared by reaction of an aliphatic, aromatic or alicyclic amine with an alkylene oxide, eg, ethylene oxide. Should the condensate not be sufficiently soluble, it might be applied in the form of its water-soluble salt or in the quaternized state.

*Example*: Wool was dyed in a bath containing a brown azodye (diazotized hydroxyaminobenzene plus diamino benzene sulfonic acid), sodium monochromate, ammonium sulfate, Glauber's salt and the condensate of dodecylamine with 6 mols ethylene oxide. The goods were entered at 60° C in this bath, which was brought to the boil within 30 min and kept boiling for 45 min. Acetic acid was added and boiling continued for 45 min more. A strong brown color was obtained, whereas a weak, useless shade resulted when dyeing was carried out in the absence of the nonionic assistant.

*Among the references cited by the Patent Offices:*

USPat 2,520,105 (Am Cyanamid/1950): metachrome dyeing carried out in the presence of alkaline earth salts and a surfactant composition containing at least one nonionic agent, eg, the condensate of octadecylguanidine bicarbonate with ethylene oxide.

USPat 2,638,404 (Am Cyanamid/1953) describes a method for level dyeing with metallized dyes in the presence of nonionic agents obtained by condensing an alkylene oxide with 2-alkyl-guanamines, eg, stearoguanamine (cf *Am Dyestuff Reptr* 43, 67 (1954)].

### TIPPY DYEING OF WOOL PREVENTED——Nonionic Amine Derivatives Used C, 4, 06

USPat 2,763,530 (Ciba Ltd——Schuetz et al——Sept 18, 1956)

This patent is somewhat akin to USPat 2,763,529 (see preceding abstract), which refers to a method of dyeing with metallizable azo dyes in a single-bath process on wool, wherein condensates of higher amines with ethylene oxide or polyoxyalkylating agents in general are used as assistants.

The current patent, assigned to the same company, is concerned with the avoidance of tippy dyeing of wool, especially when metallizable azodyes are used. Suggested auxiliary agents to prevent tippy dyeing are amines condensed with alkylene oxides, optionally solubilized by quaternization or by transformation into water-soluble salts. These are applied preferably during the dyeing operation, but they may also be applied in a separate treatment.

*Example*: Wool is dyed by the afterchrome method with a metallizable bluish-gray azodye in the presence of a condensate of oleylamine with ethylene oxide.

*Among the references cited by the Patent Office:*

USPat 2,520,081 (Am Cyanamid/1950) discusses metachrome dyeing in the presence of a soluble zinc or cadmium salt and a nonionic surfactant, eg, the condensate of octadecylguanidine bicarbonate with ethylene oxide [cf *Am Dyestuff Reptr* 40, 133 (1951)].

Millson, in *Am Dyestuff Reptr* 38, P378-92 (1949), discusses the effect of metals on tippy dyeing in chrome-dyeing processes. Differences encountered in using the top-chrome or the metachrome methods are noted and the possible prevention of tippy dyeing by applying leveling agents is discussed.

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### STRIPPING AND LIGHTENING WOOL DYEINGS——Nonionic Amine Derivatives Used C, 1

USPat 2,769,684 (Ciba Ltd——Geigy et al——Nov 6, 1956)

USPat 2,763,529, assigned to the same company, protects the use of nonionic compounds, particularly of higher amines condensed with ethylene oxide, in single-bath chroming processes.

The current patent suggests that similar nonionic compounds may be applied for stripping of wool or nylon dyed with acid dyes and also with some direct dyes. The acid dye group may also comprise metalliferous, ie, chrome, dyes; some direct dyes of the Chlorantine series that can be stripped by this method are also enumerated. The nonionic assistants are reaction products of higher amines, also of rosin amines or polyamides of higher fatty acids (example 3e) with ethyleneoxide. The condensation is carried out in the presence of sodium metal.

*Example*: Wool dyed with Cloth Fast Blue (*CI* 288-9) was treated for one hour at 90° C in a bath containing 2-5% of an octadecylamine-ethylene oxide condensate and 4% acetic acid. A good stripping effect has been reported.

*Among the references cited by the Patent Office:*

USPat 1,970,578 (I G Farben/1934): carboxylic compounds or amines condensed with alkylene oxides are suggested as textile assistants (Emulphor).

USPat 2,003,928 (Imp Chem Ind/1935) discusses stripping with reducing agents in the presence of higher amines.

USPat 2,155,135 (Sandoz/1939) discusses the use of condensates of hydroxylated amines or ammonia condensed with alkylene oxides as vat dyeing and stripping assistants.

USPat 2,525,770 (Arkansas Co/1950) suggests the use of condensates of polyalkylene polyamines and higher fatty acids in reducing liquids as stripping assistants for vat dyeing.

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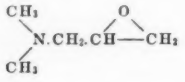
### PIGMENT PRINTING——Reaction Products of Polyamines and Cross-Linking Agents D, 2, 07

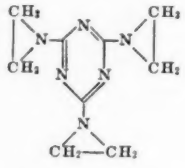
USPat 2,762,718 (Farbenfabriken Bayer—Kleiner et al——Sept 11, 1956)

This patent is a continuation-in-part of USPat 2,643,958 [cf *Am Dyestuff Reptr* 43, 17 (1954)]. The earlier patent protects a printing composition consisting essentially of a) resinous polyamides, insoluble in water but soluble in the form of their salts and b) polyfunctional compounds capable of reacting with amino or imino groups of a and generally termed "cross-linking agents."

The present modification introduces further basic polymeric compounds. These include reaction products of ammonia or amines with alkylene oxides or epichlorohydrin, eg, the compound obtained from epichlorohydrin and dimethylamine



also *basic polyureas* obtained by the reaction of polyamines with diisocyanates. Compounds containing at least *two epoxygroups or ethylene imine groups* reacted with cyanuric chloride and represented by the formula



may also be added to the group of cross-linking agents mentioned in USPat 2,643,958.

An example cites the following printing paste composition: as the pigment, copper phthalocyanine blue; as a resinous polyamide (a), a basic polyurea prepared by the reaction of polyamines with hexan diisocyanate; and as the cross-linking agent (b), hexahydro triacrylyl-s-triazine (mentioned also in USPat 2,643,958).

It may be repeated that the essential feature of the patents belonging to this series is that the pigment binding agent is soluble in the aqueous printing paste in contrast to known methods in which the binder is either a solvent or a dispersion.

*Reference cited by the Patent Office:*

USPat 2,643,958 (see above).

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## METALLIZED AND WATER REPELLENT CLOTH G, 2, 02

USPat 2,767,104 (The Cravenette Co——Avery ——Oct 16, 1956)

Light- and heat-reflective coatings obtained by the application of flake metals have been described in the past. Methods of metal-coating known in the prior art reportedly have produced very stiff fabrics, which often were not water repellent and had a tendency to leak at cracks formed by unbroken parts of the metal fixing adhesive.

The current method is designed to render porous cloth durably water-repellent and at the same time heat insulating and flexible. The invention calls for applying, as an adhesive, an oil-in-water emulsion of curable resins combined with a water-repellent salt. The curable resin is a polyamide obtained by copolymerizing di- and trilinoleic acid with ethylene diamine. (This resin has been described in *J Am Chem Soc* 70, 760-63 [1948]; it is marketed in the form of a suspension of 42-45% solid content by General Mills under the tradename B 1001 X). The water-repellent composition is an emulsion of wax and an inorganic salt (zirconium salt), which has to be buffered at pH 3-5.5 to be compatible with the above resin. Both components are homogenized and stored, while the metal powder, preferably aluminum, must only be stirred in shortly before use. Cloth is covered with this composition, dried and cured at 260-280° F while the water-repellent mixture is set. The resinous layer must be broken finally into small areas by calendering to enhance flexibility.

An example of the final composition is given as:

| | | |
|---|---|---|
| 14.25 | % | B 1001 X polyamide resin |
| 10.00 | " | Zirconium salt- wax (water repellent) |
| 1.65 | " | aluminum powder |
| 74.10 | " | water. |

*Among the references cited by the Patent Office:*

Brit Pat 223,529 (Ioco Rubber & Waterpr Co/1924): metallized waterproof fabrics are produced by covering the material with a linseed oil varnish, sprinkling aluminum powder thereon and covering with another protective layer.

USPat 1,210,375 (Tingue, Brown & Co/1916): coated fabrics (printers blankets) covered with an adhesive layer and sprayed on top of the layer with metal.

USPt 2,641,558 (National Lead Co/1953): zirconylates combined with waxes as water repellents (cf *Am Dyestuff Reptr* 42, 891 [1953]).

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## Abstract——

*(concluded from page 373)*

temperature of about 185°F. In the steaming operation, which should follow immediately, it is best to use completely expanded steam at a temperature of 212°F and a r h of 100%. The steaming time should be at least 3 minutes for dark shades.

The pad-roll process consists of the following two stages. First, the goods are treated with the dye liquor on the padding mangle, as in the case of the pad-steam process. They are then heated by infrared radiation to about 176°F. Immediately following this they enter a heated chamber in which they are batched up and allowed to rotate slowly, the length of time depending on the depth of shade.

In the pad-roll process, as well as in the pad-steam process, the state of aggregation of the dyestuff is the most important factor, apart from the solubility.

The author gives many details of these two dyeing methods, and discusses the selection of suitable dyes. —WHC

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## Improved Polymers and Co-polymers of Acrylonitrile.

Somers, J A, *Man-made Textiles* **33**, 49-50, December, 1956

To provide a whiter fiber, to increase the affinity for wool dyes, and to raise softening or melting temperatures constitute the main objects of most of the research work at present being carried out on polymeric substances containing a high proportion of acrylonitrile.

One advance lies in the discovery that polyacrylonitrile and co-polymers of acrylonitrile can be satisfactorily stabilized, so that they are less likely to discolor or become embrittled on exposure to light and heat, by incorporating from 5 to 15 percent of certain types of organic compound in the raw polymer. Several different types of products which have this property are described.

A new method of introducing basic groups into the polyacrylonitrile fiber so that it may be dyed with acid wool dyes consists in co-polymerizing acrylonitrile with an aryl sulfonic ester of an unsaturated alcohol, and reacting the copolymer with an amine (eg, diethylamine or pyridine). These reactions, and other similar ones, are described by the author.

This introduction of basic groups to increase the affinity for dyes can often be the cause of greater instability of the fiber and its tendency to discolor. It has now been found that reasonable freedom from discoloration and embrittlement of the fiber on prolonged exposure to light and heat can be obtained if 5 percent of maleic acid and a special catalyst are present during the co-polymerization process. The reactions involved are explained.

Several references to the patent literature are given.—WHC

# News of the Trade

## E F Drew Golden Anniversary

E F Drew & Co, Inc, marking fifty years of progress, opened the doors of its Boonton, NJ, plant to the public April 26-27 for an elaborate open-house celebration.

Starting in 1907 in East Boston, Mass, the firm has become one of the nation's leading producers of vegetable oil specialties for a wide variety of industries throughout the world.

In the textile chemical field, Drew produces a well-known line of "bread and butter" products for processes common to many mills, as well as a number of specialty products, under the leadership of John P Redston, manager Textile Chemical Division. This Division also offers unique and complete "processes" employing Drew auxiliary chemicals; in this case the firm sells the "process" and product.

Drew boasts an outstanding record of textile chemical development during its 50-year history. During World War II, Luxolene, a synthetic olive oil to replace natural imports, was introduced. In 1945 Drew became the largest producers of coconut fatty acid diethanolamine condensates, a synthetic detergent for fulling and scouring of raw wool. Coronyl, an official parachute finish, was introduced during the Korean War. 1954 saw the development of the Druterge W Process, nonionic scouring of wool in the absence of added alkali (first introduced for fine apparel wools for worsted top manufacture).

More recent developments include Pyroban, for permanently flameproofing cotton on a mass basis; the acid fulling of wool to replace soap and soda ash and increase strength; the Drutones, a new approach to cotton softeners; Drusil 30, a silicone-base durable water repellent; Druspin Supreme and Druspin PF, antistatic fiber lubricants; the Druterge series of synthetic detergents; and Luxolene S, a self-emulsifying glyceryl trioleate for wool spinning.

Drew moved its headquarters for refining from East Boston to Boonton in 1917, where, with one small refining tank, employees managed to refine a limited amount of oil, and then went into action to sell it as quickly as possible. The money received for one car of oil was used immediately to purchase another car of unrefined oil, and thus the ever-enlarging cycle continued. Along the way financial and technical difficulties were overcome.

E F Drew & Co, Inc's Boonton, NJ, plant

From 1937 an "Establishing Stage" evolved and with it E F Drew & Co, Inc, established itself as an important, permanent organization in the buying, refining and marketing of coconut oil. Through research more and more uses for this oil were developed, especially in the edible oil field. Gradually the refining of edible oils brought about more and more by-products which opened up new fields for the Drew organization, to a point where, today, the organization stands as a parent company with about twelve divisions, each one active in promoting products essentially based on fats or fat derivatives. In the textile field, research has brought about Drew activity in waterproofing, fireproofing and mothproofing of textiles.

DA Coape-Arnold, Drew's executive vice president, joined the company in July, 1955 as assistant to the president. He assumed his present duties in November, 1956.

George Zinzalian, vice president of E F Drew and director of the Technical Products Division, who has been associated with the firm for 23 years, was responsible for the initiation of the first research department of the organization.

Coape-Arnold

Zinzalian

## Sterling Drug Acquires Newark Pigment Company

Sterling Drug Inc has acquired Thomasset Colors, Inc, Newark, NJ, prime manufacturer of pigments phthalocyanine blue and green as well as a line of drug and cosmetic colors.

The Thomasset company will be operated as a Sterling subsidiary. Paul Thomasset, who founded the business in 1946, will continue as its president. The Newark firm will function in close technical collaboration with The Hilton-Davis Chemical Company, Cincinnati, a Sterling division.

Hilton-Davis will market Thomasset's phthalocyanine blue and green, important pigments for the industries presently served by the Cincinnati chemical company. However, Whittaker, Clark and Daniels, Inc, New York, will continue to act as sales agent for the two pigments in the New York metropolitan area.

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## Union Carbide and Three Division Change Names

The name of Union Carbide and Carbon Corporation has been shortende to Union Carbide Corporation. Stockholders approved this change at the Annual Meeting of the Corporation on April 16.

The names of three divisions of Union Carbide have also bee changed. Carbide and Carbon Chemicals Company has become Union Carbide Chemicals Company; Linde Air Products Company is changing its name to Linde Company; and Carbide and Carbon Realty Company will be known as Union Carbide Reality Co.

## OMCC Industrial Chemicals Div to Market Kaiser Chlorine Output

The Industrial Chemicals Division of Olin Mathieson Chemical Corporation will market all of the chlorine output of the new chlorine-caustic soda plant being constructed by Kaiser Aluminum and Chemical Corporation at Gramercy, La.

Scheduled for completion this Fall, the plant reportedly will have a capacity of 100 tons per day of chlorine and equivalent caustic soda. The caustic will be used by Kaiser Aluminum in its new alumina manufacturing operation at Gramercy.

The Kaiser Aluminum plant will make a fifth Olin Mathieson shipping point for chlorine in the South. Olin Mathieson presently produces chlorine at Saltville, Va, and McIntosh, Ala, and markets the chlorine output of the Huntsville, Ala, plant of National Distillers Products Corporation. It is completing a bulk storage and distribution facility for chlorine and other chemicals at Brunswick, Ga.

Olin Mathieson additionally produces chlorine at Niagara Falls, NY, and markets the production from the Arvida, Que, plant of Aluminium, Ltd.

* * *

The Industrial Chemicals Division's St Louis district offices, formerly located in the Rialto Bldg at 220 North Fourth St, have been moved to 8000 Bonhomme St (St Louis 5). Charles H Larson is district manger.

## CATCC Bronze Medal to Fitton

Presentation of the coveted Bronze Medal of the Canadian Association of Textile Colourists and Chemists was made in Montreal on April 27th at the Association's annual dinner in the Sheraton-Mount Royal Hotel.

**Charles F Fitton,** Sandoz Chemical Co Ltd, Montreal, was presented the annual award for "outstanding service to the Association, particularly in the field of textile education". Mr Fitton has been a member of CATCC since its beginnings in the late 30's. During that time he has devoted much time to organizing and teaching special classes sponsored by the CATCC to increase technical knowledge within the Canadian textile industry.

Leon E Moody, past president of the Association, in his final address, called upon Canadian textile technical men to intensify their activities towards making this industry the most efficient and the most quality-conscious in the world.

## Boston Branch of National Aniline Wins AC&D Safety Award for '56

The Allied Chemical & Dye Corporation Safety Award has been presented by H J Daigneault, vice president of National Aniline Division, to A E Sampson, Boston Branch manager representing the employees in the Boston warehouse and laboratory. H L Rieg, director of dyestuff sales and branch operations, and F J Krueger, director of engineering and construction, attended the presentation ceremonies held recently at the Company's Boston offices at 150 Causeway Street.

The Award is presented annually by Allied Chemical in recognition of record low accident frequency rate during the year. The Boston Branch completed the yearly contest with the most man-hours worked without a lost-time accident within its group and class under the Company's Annual Safety Contest, completing over 37,000 man-hours worked without a lost-time accident.

A bronze plaque was presented by Mr Daigneault. Each employee was presented with a pen and pencil desk set in further recognition of the achievement.

## Nopco Opens Los Angeles Sales Office

J E Connell, sales manager of the West Coast Division of the Nopco Chemical Company, Richmond, Calif, has announced the opening of a Los Angeles sales office for Nopco's Industrial Chemicals Division and the Metasap Chemical Company, Nopco's wholly owned subsidiary.

Working out of the new office, located at 4858 Valley Boulevard, will be F R Gagnier and D E Murphy, who will handle the sales of Nopco's industrial processing chemicals.

Telephone communications with Nopco can now be completed by calling CApitol 1-3128.

## Hatch Research Marks 31st Year

May 1, 1957 marked the 31st anniversary of Hatch Textile Research, Inc, New York, N Y, commercial textile testing laboratory founded in 1926.

The laboratory, which is now undergoing a modernization program, has been at its present location at 25 East 26th Street since May, 1939. In the past year a new member has been added to the staff.

## NFT Members Favor Consolidation with ACMI

Members of The National Federation of Textiles, Inc, meeting on April 25, 1957, at their headquarters in New York, adopted a resolution favoring a consolidation of the Federation with The American Cotton Manufacturers Institute, Inc, following a similar action taken by the members of the latter association at their convention in Palm Beach earlier in April.

At the Federation's meeting, presided over by President Andrew J Sokol of J P Stevens & Co, Inc, authorization was given to the board of directors to take whatever action which might be necessary or expedient to affectuate such a consolidation.

It is understood that the board of directors will meet at an early date to discuss the framework which will be necessary to bring about this important step in the long-range objective of having a single organization to coordinate the cooperative activities of the makers of textile products.

## Duraloom Offering Mitin Mothproofing in All Carpet Lines

Duraloom Carpet Mills, Inc, Lehighton, Pa, is offering "built-in" Mitin mothproofing in all its lines, according to an announcement made recently by Godfrey Bloch, president. Some of Duraloom's numbers are already being delivered with this mothproofing, and it is anticipated that in a few months all will have this added feature.

All Duraloom lines, in all their colors or combinations, will be durably mothproofed with Mitin, according to Mr Bloch.

Mitin is applied to yarn during the dyeing stage, and, once properly applied, it is said to make the carpet resistant to moth and carpet beetle larvae for its normal life. Mitin reportedly withstands repeated cleanings, is not rubbed off by foot traffic, and does not alter the feel of the carpet. It is said to be odorless, colorless, fast to weathering and light, and nontoxic.

Introduced to the U S by Geigy Dyestuffs in 1950, Mitin has been widely used on wool or wool-blended apparel, but only recently has it found acceptance for carpeting, especially in the contract field.

Duraloom has not increased its retail prices on carpets that have been mothproofed.

## New Protective Treatment for Fabrics

A chemical process which is said to appreciably enhance the toughness and longevity of a wide variety of fabrics and other materials has been announced by Tee-Pak, Inc, Chicago, Ill. W G Tebbens, technical director, states that the new process can be used with many products including cotton, rayon, burlap, canvas, rope, jute, and paper.

Primary use of the product to-date is with cotton used as a shade covering for tobacco plants. It is claimed that, by applying the process to cotton, the fabric is made virtually mold- and rot-proof.

Dr Tebbens has stated that treated samples of cotton have been buried in wet soil without deleterious effects for as long as 140 days. Untreated cotton samples buried in the same soil disintegrated in less than a week.

In addition, Dr Tebbens said, the process also considerably improves the "breaking strength" of the material. He said it is the first protective process which has a permanent effect on the fabric. Laundering and dry-cleaning of the fabric have no effect on the protective properties.

The principle chemical used in the process is acrylonitrile in the presence of a catalyst, the fiber of the fabric reacts with the chemical causing a change in the characteristics of the fiber. The basic chemical "building blocks" of the fiber are bonded together as a result of the process. The treatment may be used to increase the weight of the material from a few percent to as much as 150 percent.

Dr Tebbens stated that the process is quite inexpensive. At this time, cotton shade cloth can be treated for only a few cents per square yard. No special equipment is required. Conventional wet-finishing equipment, such as ordinary tanks and jigs, are all that is necessary.

Other potential applications are for awnings, rope, shower curtains, bath mats, hotel and domestic linens and such military uses as field uniforms and tentage.

The process was discovered in Tee-Pak's research laboratories some years ago and development work has continued since then. Two years ago, the company retained the Textile Research Institute to work on the project.

Dr Tebbens stated that, by varying the reactants and their concentration, an extremely broad range of treatment intensities can be achieved to give the process great flexibility. He explained that this makes it possible to keep the processing cost to a minimum.

The process can be applied so that only that portion of the fabric which will be subjected to the degenerating elements need be processed.

Tee-Pak plans to license the process.

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## Environmental Test Chamber

A new environmental test chamber for use with the Instron tensile testing instruments has been announced jointly by Fabric Research Laboratories, Inc, Dedham, Mass, and Custom Scientific Instruments, Inc, Kearny, N J.

The test chamber was designed by Fabric Research Laboratories, and several of the chambers have been built by them.

**Environmental Test Chamber and control panel (left) shown with Brown Recorder (right)**

It is now being built by Custom Scientific Instruments with the cooperation of FRL. Temperatures from —98°F to +700°F reportedly can be achieved with precise control of ±1° to 2°F. The chamber fits all Instron tensile testing instruments except the table model.

Working space within the chamber is said to permit the use of most normal jaws and to allow for the testing of ten-inch samples with up to 80% rupture extension. The apparatus is self-contained on a roll-away carriage and can be used as an oven or cold chamber.

## Bradperma CM1

Ernest Chornyei, vice president, Bradford Dyeing Association (USA), New York, NY and Bradford, RI, recently announced a new chlorine-resistant cotton finish developed by Bradford's research laboratories.

The new finish, called Bradperma CMI, reportedly offers a 100% "drip dry" feature and chlorine resistance to cotton fabrics for shirts, shorts, pajamas, uniforms, blouses, and white goods of all kinds.

Chornyei stated that "bleaches and detergents may be used safely on cotton finished with Bradperma CMI without fear of the material turning yellow."

Bradperma CMI, which is used in conjunction with the mercerized Rigmel Shrunk process, reportedy keeps residual shrinkage within 1%. Users of Bradperma CMI may apply for the Good Housekeeping seal.

Asked as to what field the new finish would benefit most, Mr Chornyei answered, "that the development is particularly important in the men's shirt field since, through this process, it becomes possible to make a cotton dress shirt crease resistant and drip-dryable and at the same time lengthens the life of the garment through its chlorine-retardant qualities. The importance of the development is doubly important when figures reveal that at the present time cotton accounts for 74% of the shirt market, and this number has not in the past shared in the values imparted by the new development."

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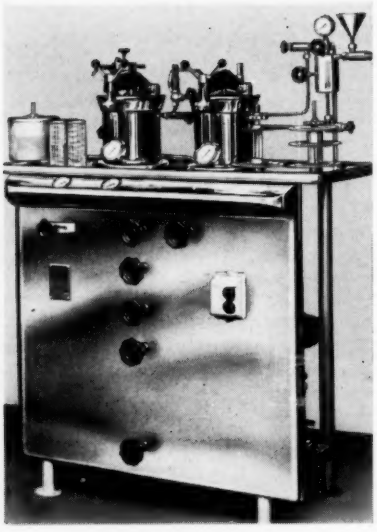
## Sandothrene Yellow NLGR Paste Ultrasperse

A new addition to its line of dyestuffs has been announced by Sandoz, Inc, 13 Van Dam St, New York 13, N.Y.

Sandothrene Yellow NLGR Paste Ultrasperse, a new level-dyeing vat color, is said to be highly rated for fastness to light, even in pastel shades. It is recommended by Sandoz for application by all methods. It is stated that, with this dyestuff, there is no tailing out on long runs. It reportedly may be printed by the flash aging method, exhibits good all-around fastness properties, and shows best results in pigment application. Folders illustrating its properties are available from any Sandoz District Office.



Scholl Ltd Laboratory Dyeing Machine

## Scholl Laboratory Dyeing Machines

A new line of high-temperature laboratory dyeing machines, specifically designed for dye experimentation and research, are being introduced in the United States by Cosa Corporation, 405 Lexington Ave, New York 17, N Y. These machines are said to provide a versatile and dependable means of pretesting dye formulas and techniques on any textile fiber in any form.

Made by Scholl Ltd, the machines have been field proven in one of Switzerland's largest dyehouses. They are exactly proportioned to full-size production machines. It is claimed that, by pretesting with these machines, dyers can carry out subsequent, full-scale dyeing without stopping for changes or corrections.

Dyeing can be begin above or below the boiling point and be carried on with or without pressure. Dyestuffs and chemicals can be added, and samples taken at any time, without interrupting the dyeing cycle even during high-temperature dyeing, it is stated. By means of the overflow and reserve tank, a new bath can be prepared while dyeing is continued in the main pressure kier. A window permits observation of the liquid within the machine.

Scholl's largest laboratory machine is designed specifically for the research departments of dyestuff manufacturers. Cosa points out that all Scholl Laboratory Dyeing Machines are constructed with the finest craftsmanship of acid-resistant stainless steel. They are said to be easy to service and extremely low on maintenance.

## "J" Series Added to Poly-Tergent Line

A new "J" series has been added to the Poly-Tergent line of nonionic surface-active agents introduced earlier this year by the Industrial Chemicals Division of Olin Mathieson Chemical Corporation, Baltimore 3, Md.

An outstanding characteristic of the new series is said to be the wide temperature range over which the products are effective. Reportedly extending from 0 to 100°C, this range is greater than that available through most other large volume nonionics.

One member of the series, Poly-Tergent J-500, can be used at the boiling point of water without serious loss of its surfactant properties, it is claimed.

The "J" series consists of four products of ascending molecular weights. All are aliphatic polyoxyethylene ether alcohols. They are clear liquids of low viscosity, pale yellow to amber in color, and with a mild, pleasant odor.

All members of the series are said to be good wetters, detergents, and dispersants. They reportedly are stable under a wide range of conditions, and because of their effectiveness at low concentrations they can be employed under many conditions of marginal compatability. In all phases of textile processing, it is claimed, they compare favorably with standard commercial surfactants.

Poly-Tergents J-300 and J-400 are said to be effective scouring agents in all stages of wet processing and types of equipment. In desizing, they reportedly will improve the penetration of starch-liquefying enzyme baths at levels as low as 2 to 4 ounces per 100 gallons of desizing liquor.

Ability to function in highly alkaline solutions and at elevated temperatures makes the "J" products effective aids in kier boiling of cotton raw stock, yarn and piece goods, in both open and closed kiers.

As bleaching assistants, J-300 and J-400 assist wetting and keep the bath clean without undergoing decomposition from either hypochlorite or peroxide, it is stated. Both products are said to be equally efficient in promoting wetting in the dye bath.

All members of the "J" series are claimed to be compatible with basic colors as well as direct or acid colors, and can serve as retarding or leveling agents. J-500 is said to be particularly effective as a leveling agent.

The high chemical and metallic stability of J-300 and J-400 reportedly make them especially effective in the soaping of prints and vat and naphthal dyeings.

It is stated that J-200, J-300 and J-400 are useful in finishing baths where instantaneous wetting of the fabric is important. It is further stated that all members of the series can be used with many finishes to promote speed of penetration without appreciably affecting such properties as hand, crease resistance, and tensile and tear strength. In fact, the manufacturer states, J-400 seems to improve flexibility.

All members of the Poly-Tergent "J" series are available in 5 and 55 gallon drums and in tank cars.

Technical bulletins may be obtained from Olin Mathieson.

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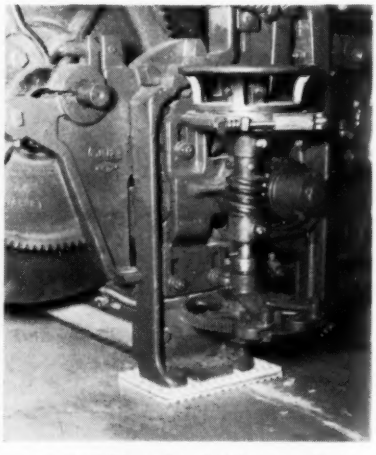
## "Tiger Paw" Vibration Pad

A new-type durable pad designed specifically for use with machinery subject to vibration has been introduced by E H Jacobs Northern Div, The Bullard Clark Co, Danielson, Conn.

A combination of polyvinyl chloride resins reinforced with fiber glass is said to produce a substance that has excellent resiliency and durability. This composition reportedly enables "Tiger Paw" pads to withstand oil, soap, detergents, water, fungus, acids, bases and salts.

Functionally designed with suction cups molded into the parallel surfaces, the "Tiger Paw" is said to hold machinery to the floor without the use of adhesives, and at the same time eliminate vibration problems. There is no setting or bolting required; the pad is simply placed under the machine. Whenever machinery is moved, the durable pad is simply placed under it again in the new location.

"Tiger Paw" is available in 22″ x 22″ sheets for stockroom supply, or cut to proper machine foot size.



Jacobs "Tiger Paw" Vibration Pad

# • NAMES IN THE NEWS •

Roberts

Bryant Chemical Corporation has announced the addition to its technical staff of **Richard Roberts,** formerly with the research department of the Tecnifax Corp of Holyoke and prior to that for five years in the research deportment of the Chicopee Mfg Co at Chicopee Falls, Mass. Mr Roberts will be located at the Bryant Chemical Research and Development Laboratory at Hingham, Mass.

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**D G Zachary** has been named district sales manager for textile resins in the metropolitan New York—New Jersey district of the Organic Chemicals Division of American Cyanamid Company. He will make his headquarters in Bound Brook, succeeding **R M Fischer,** who will retire on July 1, 1957 after 17 years of service with the company.

Mr. Zachary joined American Cyanamid in 1947 as a technical trainee. In 1948 he became a salesman for the textile resin department of Cyanamid in the same territory he now heads.

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**A C Mackey** has joined the Osco Chemical Co, Inc, 710 Tenth St, NW Atlanta, Ga, in the capacity of vice president and sales manager.

Mr. Mackey was formerly with Onyx Oil & Chemiacal Co for twenty years, most recently as director of the Hosiery and Industrial Chemical Divisions.

Osco is engaged in the manufacture and distribution of textile and industrial chemicals.

Mackey

Clancy

McDermott

Quinty

Showers

**Joseph P Clancy** has been appointed eastern district sales manager of the Organic Chemical Sales Department of Emery Industries, Inc, succeeding **J W Ritz,** recently named assistant sales manager. Mr Clancy, who joined Emery in 1949, will make his headquarters at the Company's Philadelphia office.

Additional changes in the Organic Chemical sales force include: the appointments of **Joseph E Quinty** to the Chicago office, **William C Sowers** to the New York office, and **Arthur R McDermott** succeeding Mr. Clancy as New England representative. Quinty, with Emery since 1953, has been in the New York-New Jersey area. Sowers joined Emery in 1953, serving as sales representative in the Cleveland, Detroit and Chicago area. McDermott has been active in sales and development work since joining Emery last year.

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Three important staff assignments have been announced by Alco Oil & Chemical Corp, Philadelphia, Pa.

**C E Cain,** formerly head of Alco's Sales Service Laboratory, has been made head of a new Planning Department, which will handle work on various new Alco textile, chemical and rubber products as well as supervise process details.

Succeeding Cain as head of the service laboratory will be **Carl W Denfeld,** a member of the chemical sales service staff of Alco since 1953.

In an addition to staff, Robert A Moctezuma joins Alco as an analytical chemist. Moctezuma had previously served as chief chemist of Davis & Weil Mfg Co, Tampa.

Jenny

Jersey State Chemical Co, Haledon, NJ, has announced the appointment of **Albert R Jenny** to the newly-created position of general sales manager.

Mr Jenny brings to the company over 25 years of chemical experience, both in sales management and in actual field sales of chemicals to a wide variety of industries.

The newly-made appointment reportedly will enable Jersey State to coordinate its continuing manufacturing and sales expansion plans with a number of new products. New outlets and an expanded representative organization covering New England, the southern and mid-west areas are also planned.

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Metro-Atlantic, Inc, Centredale 11, RI, has announced the recent appointment of **Boyce C Bond** as resident manager of the Philadelphia sales territory.

Mr Bond, formerly director of the British Dyestuff Corp Laboratories, now the Imperial Chemical Industries in Boston, was also employed by the Farr Alpaca textile plant as superintendent of dyeing and finishing. He has also spent 19 years with General Dyestuff Corporation in the Philadelphia sales and service area. He held the position of sales supervisor for Pittsburgh Coke and Chemical Company.

Mr Bond is the inventor of the Bond Dyeing Machine which is now being manufactdured by the Textile Shops, Spartanburg, SC.

Bond

King

Platner

Talley

W Adrian King has been named general sales manager of the Industrial Chemicals Division of Olin Mathieson Chemical Corporation as one of six executive promotions in the Division.

James C Laney succeeds Mr King as manager of the automotive products department.

James F Newell has been appointed assistant general manager of the Industrial Chemicals Division. He was formerly manager of the products department.

Charles C Hightower succeeds Mr Newell as production head, with responsibility for operation of the division's twelve plants. He has been manager of the Lake Charles, La, plant since 1954.

W Carlton Moseley, formerly assistant plant manager at Lake Charles, has been named plant manager.

Cecil L Williamson, who has been manager of the division's administrative services department in Baltimore, has been appointed assistant to the division general manager.

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John Platner, E W Scott and J P Talley have been promoted to new posts by the Chemical Division of the Goodyear Tire and Rubber Company.

Platner has been appointed assistant manager of the coatings department, replacing G H Campbell, who recently was transferred to the Goodyear International Corporation. Platner came to Goodyear in 1947 and was engaged in film research for six years before joining the Chemical Division. As a coatings department representative for the past four years, he has specialized in the styrene-butadiene resins and latices marketed under the Pliolite trade mark.

Scott, former sales service representative for specialty coatings, has been named manager of sales development for the department. This newly created unit has been formed to expedite the introduction of new coating materials for the textile, paper and paint industries.

Talley will take over the sales service position formerly held by Platner. Prior to his newest appointment, he was a development engineer in the Chemical Division laboratories.

Scott

S J Hungerford, Textile Fibres Division, Du Pont Co of Canada, Montreal, has been elected president of the Textile Technical Federation of Canada.

Other officers are: Past President——J A Dixon; Vice presidents——F J Knight, Canadian Association of Textile Colourists and Chemists, Quebec Section, and L J Sheps, Institute of Textile Science. Honorary treasurer is E A W Boyce, Kingston District Textile Technical Association.

Directors are: E P Carney, CATCC, Ontario Section; C V Grantham, Textile Society of Canada, Western Division; George Marshall, Cornwall and District Textile Association; John Nodtvedt, Eastern Townships Textile Association and Walter Stansfield, Ottawa Valley Textile Association.

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Louis J Dogin, formerly with American Aniline Products, Inc, since 1926 as salesman and manager in the New York-New Jersey metropolitan area, has been appointed to the staff of the Brook Chemical Division of A Hollander & Son, Inc.

Mr Dogin in his new position will be in charge of all sales from the home office at Clifton, NJ.

Dogin

## General Calendar

**AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE**
Gordon Research Conference on Textiles, July 8-12, Colby Jr College, New London, NH

**AMERICAN HOTEL ASSOCIATION**
June 24-25 (Hotel Textile Purchasing Course, Cornell Univ, Ithaca NY)

**AMERICAN OIL CHEMISTS SOCIETY**
Sept 30-Oct 2, 1957 (Fall meeting, Cincinnati); Apr 21-23, 1958 (Memphis); Oct 20-22, 1958 (Chicago); Spring, 1959 (New Orleans); Fall, 1959 (Los Angeles)

**AMERICAN SOCIETY FOR QUALITY CONTROL—TEXTILE DIVISION**
8th Annual Conference—Jan 30-Feb 1, Clemson House, Clemson, SC

**THE DRYSALTERS CLUB OF NEW ENGLAND**
June 21 (Annual Outing—Wachusett Country Club, West Boylston, Mass).

**THE FIBER SOCIETY**
Sept 4-6 (Joint meeting with the Textile Institute—Hotel Statler, Boston, Mass)

**NATIONAL COTTON COUNCIL OF AMERICA**
May 28-29 (Cotton Textile Market Conference—Hotel Statler, New York, NY); October 2-3 (Chemical Finishing Conference—Statler Hotel, Washington, DC)

**PHILADELPHIA TEXTILE INSTITUTE ALUMNI ASSOCIATION**
June 6-8 (Alumni Day, Alumni Outing, PTI Commencement)

**SOUTHERN TEXTILE ASSOCIATION**
June 20-22 (Annual Convention—Ocean Forest Hotel, Myrtle Beach, SC)

**SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES**
May 26-28 (Annual Outing Skytop, Pa); June 11, Sept 10, Oct 8, Nov 12 (Palm Terrace Suite, Hotel Roosevelt, New York, NY)

**TUFTED TEXTILE MANUFACTURERS ASSOCIATION**
May 30-June 1 (Annual Convention—Fontainebleau, Miami Beach, Fla)

**NOTE**

Regarding the article, "The Standardization of Test Methods for Textile Auxiliaries. II—Determination of Vat Acid Dispersion Power of Surfactants", which appeared on pages 278-80 of the April 22nd issue, notation is made as regards Nova Chemical Corporation's distributorship in the U S A of BASF dyestuffs, pigments, textile auxiliaries, and waxes manufactured by Badische Anilin- & Soda Fabrik AG, Ludwigshafen a Rhein, Germany.

# TECHNICAL LITERATURE

**(It is understood that the following literature is available from the sources listed in italics).**

**A GOOD QUESTION . . .**—*Du Pont Film Dept, Wilmington 98, Del*—New fabric opportunities created by the development of metallic yarns made with Mylar poylester film are outlined in this new booklet.

The booklet is the first step in a new information program designed to provide mills and other users of metallic yarns with facts about yarns made with Mylar.

Included are answers to questions most frequently asked by fabric designers, mill superintendents, buyers, and sales executives during an eight-month field survey on metallic yarns recently completed. Despite the increased use of metallic yarns, the survey found a lack of information at all industry levels.

The booklet shows how many mills have been able to use metallic yarns successfully for the first time by taking advantage of the improved properties of the new yarns. Included are case histories outlining how yarns of Mylar have made metallics practical in towels, sheets, linens, bedspreads, cottons, woolens, shoes, and novelty fabrics.

Construction of metallic yarns is discussed. Modern metallic yarns are made with transparent plastic films, such as Mylar polyester film. Since performance characteristics of yarns are dependent on the type of film used, the booklet includes the important properties of Mylar.

Important sections are devoted to the different types of yarn—a foil type, made by sandwiching a layer of aluminum foil between two layers of Mylar; and a metalized type, made by coating Mylar with a mirror-like deposit of vaporized aluminum and combining it with one or two other layers of film.

Which is best, foil or metalized? The booklet lists important factors to assist users in making this choice. Generally, it is recommended that both types of yarn made with Mylar be checked under practical mill conditions to determine which is best suited to withstand a particular mill's requirements for heat and acid resistance, abrasion resistance, effect on tenacity, and piece and cross-dyeability at the boil. Mills are advised, however, that metallic yarn manufacturers can best recommend a type which will give the best performance for a specific use.

The effect of heat, chlorine, bleaching, stitching, vat-dyeing, mercerizing, vulcanizing, and carbonizing on metallics made with Mylar are discussed in statements by textile companies. Yarn performance in weaving and knitting operations also is included.

The booklet includes a discussion of cost factors, pointing out that differences in yield per pound and the ability of some types of metallic yarns to run unsupported are important considerations.

**A REVIEW OF THE AIR FORCE MATERIALS RESEARCH AND DEVELOPMENT PROGRAM** — *$2.50; Order PB 111648-S2 from OTS, U S Dept of Commerce, Washington 25, DC*—H E Hines and R F Walden, Wright Air Development Center, U S Air Force; Oct 1956; 94 pages.

One hundred and forty-five reports of research conducted under the Air Force's materials research and development program from July 1, 1955 to June 30, 1956 are abstracted in this publication.

The publication contains abstracts of research in textiles, analysis and measurement, biochemistry, petroleum products, plastics, packaging, protective treatments rubber, adhesives and metallurgy.

This publication is supplementary to three other volumes, also available from OTS, of the same title. One is PB 111648-S, price $3.50, covering Air Force materials research from July 1, 1954 to June 30, 1955; another is PB 111648, price $2.75, covering July 1, 1953 to June 30, 1954; and the third is PB 111537, price $3.75, covering the 10 years of research prior to July 1, 1953.

**AN ELEMENTARY STATISTICAL APPROACH TO MICROBIOLOGICAL RESEARCH**—*$1.50; Order PB 121713 from OTS, U S Dept of Commerce, Washington 25, DC*— J S Mahan. Wright Air Development Center; Sept 1956; 59 pages.

Data from an earlier investigation to evaluate the effect of eight commercial fungicides on cotton webbings are analyzed in this report to illustrate the statistical approach. The data were treated and analyzed by a statistical summary consisting of the mean, standard deviation, and the standard error of the mean; an analysis of variance of the data; use of the Newman-Keuls test to arrange the significant treatment combinations according to their effectiveness; consideration of the results of analyzing variance and the Newman-Keuls test in relation to information concerning the phenomena associated with the use of fungicides; and using information from the analysis of variance and the statistical summary of the data to estimate the minimum sample size required for tests of fungicides according to specification requirements. The importance of random sampling and the importance and value of the statistically designed experiment are discussed.

**BENZYL CHLORIDE**—*Heyden Newport Chemical Corp, 342 Madison Ave, New York 17, NY*—Technical bulletin BZYL 1-57 reports on properties, storage and handling techniques and varied uses of this highly reactive intermediate.

Uses of benzyl chloride derivatives in dyes, bactericides, fungicides, insecticides, odorants, water-resistant starch, surface-active agents, and other applications are also described.

Benzyl chloride finds major application as a means of introducing the benzyl group in chemical syntheses as in the manufacture of benzyl benzoate, the Heyden Newport bulletin reports. Other products synthesized from benzyl chloride, which are described, include benzyl alcohol, quaternary ammonium compounds, phenylacetamide, benzyl acetate, benzyl salicylate and benzyl cyanide.

**BULLETIN 149—FIBERS AND FABRICS**—*Research Information Service, 53 Nassau St, New York 38, NY*—Bulletin 149 lists the most recent Belgian and German patent literature, which has been translated into English by RIS.

Sixteen reports are listed under "Polyesters & Polyamides"; six under "Acrylics"; seven under "Cellulosics"; and seven under "Various Textile Treatments."

**CLIMATIC EXTREMES FOR MILITARY EQUIPMENT**—*$1.75; Order PB 121741 from OTS, U S Dept of Commerce, Washington 25, DC*—N Sissenwine and A Court, Office of the Quartermaster General, Dept of the Army; Nov 1951; 70 pages.

An analysis of world-wide climatic conditions has been made by the Army and the results published as a design guide to environmental extremes which might damage military equipment.

Environmental stresses studied were thermal, humidity, precipitation, wind, penetration and abrasion, salt spray, and atmospheric pressure. Probable and practical extremes were determined for each. Conditions were established for design and evaluation of military equipment for use under world-wide, hot-desert, arctic-winter, and moist-tropical climatic extremes.

**CONSULTING SERVICES 1957 (16th Edition)**—*$1.00, Association of Consulting Chemists and Chemical Engineers, Inc, Room 82, 50 East 41st St, New York 17, NY; 136 pages; 6 x 9"*—The 16th edition offers a wealth of information and guidance for profitable conduct of business in all branches of industry, with directions for finding the right consultant to solve problems of manufacture, process improvements, research and development, plant designs and analytical and testing work in all its modern aspects.

Inside front and back covers carry excerpts from "Code of Ethics" and "By-Laws" respectively.

Table of Contents, Foreword and a page entitled "How to Find your Consultant" precede three sections as follows:

Section I) *CLASSIFIER.* Immediately preceded by a numerical index for easy

reference, this section contains over 200 items of activity, with the members specializing or qualifying in the given field indicated by key numbers which correspond with the scope pages in Section II.

Section II) *SCOPE PAGES*. These describe page by page each member's qualifications and activities.

Section III) *INDEX*. a) Alphabetically, including names of organizations with which members are affiliated; b) by geographical location, including branch offices, earmarked by an asterisk, inside and outside the United States. Of value to industry in foreign lands seeking the services of specialized American consultants.

**DEVELOPMENT OF DYEING FORMULATIONS FOR WOOL/SYNTHETIC BLENDS FOR USAF SHADE BLUE 84**—*$2.75; Order PB 121756 from OTS, U S Dept of Commerce, Washington 25, DC*—R J Peirent and A Katz, Lowell Technological Institute Research Foundation for Wright Air Development Center; Oct 1956; 110 pages.

Dyeing formulas were studied for viscose, nylon, Dacron, Orlon, Dynel, and Acrilan fibers which would permit manufacture of Air Force Serge Fabric, Blue Shade 84 from synthetic fibers and wool. No formulations were found effective for Dynel and Acrilan. However, formulations for viscose, nylon, Dacron, and Orlon produced colorfastness as good as that of the wool fibers used in blue shade 84. Wool/synthetic fabrics containing 10, 20, and 30 percent synthetic fibers were manufactured, and their colorfastness properties were found equal to a 100 percent wool control fabric. A study of the physical properties of the wool and wool/synthetic fabrics showed that they met the physical requirements desired and had adequate colorfastness as well as high resistance to fading.

**DIETHYLENE GLYCOL AND TRIETHYLENE GLYCOL**—*Union Carbide Chemicals Co, a Division of Union Carbide Corp, 30 East 42nd St, New York 17, NY*—F-8085, a new 16-page data folder, discusses these two glycols from Carbide. It presents data on physical and physiological properties, specifications, shipping containers, constant-boiling mixtures and applications. The data folder contains fifteen charts showing physical properties of interest to users of diethylene and triethylene glycols.

Diethylene glycol and triethylene glycol are important as intermediates for resins and plasticizers. Many of the applications for these glycols are based on their hygroscopic properties and excellent solvent characteristics. Diethylene glycol is also a conditioning agent and lubricant for textile fibers and a solvent for dyes.

**DIRECT FROM YOUR WATER PIPE OR TAP: INSTANT HIGH-PURITY DEMINERALIZED WATER WITH ENLEY ION-EXCHANGE WATER DEMINERALIZERS FOR INDUSTRIAL AND LABORATORY USE**—*Enley Products, Inc, 1236 Broadway, Brooklyn 21*—This catalog-type brochure discusses and illustrates improved ion-exchange water purification techniques and equipment.

The Enley brochure describes a new-type, all-plastic unit for producing high-purity demineralized water by the ion-exchange method. Since the units are available in various sizes with a variety of connective fittings, they are said to lend themselves to all kinds of industrial applications both large and small. The Enley units may be attached locally to water taps, or plumbed-in for broader applications. Special hand units are available for use in the laboratory and similar small-volume local needs.

The all-plastic design of Enley units is said to avoid corrosive contamination within the unit, to make the unit virtually indestructible, and to permit an important new use of the ion-exchange principle in the decontamination of radioactive fluids used in connection with atomic research.

**EMERSOL STEARIC ACIDS**—*Emery Industries, Inc, Dept 5, Carew Tower, Cincinnati 2, Ohio*—This 24-page brochure is designed to aid in the selection of the proper grade of stearic acid for each end use. It interprets the results of analytical tests commonly performed on stearic acids, and contains a discussion of physical properties of commercial stearic acids and their relation to its palmitic stearic acid ratio. Tables are given listing the composition of typical grades of stearic acid, as well as a stearic acid selection chart.

Also included in the booklet are a section covering the handling of stearic acid, and a complete description of all grades of Emersol Stearic Acids, with emphasis on the significance of their outstanding oxidation and color stability.

**FUNGITROL 50 FOR COLORLESS NONTOXIC CORDAGE PRESERVATION**—*Nuodex Products Co, a Division of Hueyden Newport Chemical Corp, Elizabeth, NJ*—Fungitrol 50 is a colorless, highly active fungicide for use on cellulosic materials which can be used from both water and solvent systems, Nuodex reports. Fungitrol 50 is a synergistic mixture containing zinc. It is said to be nontoxic when used for its intended applications.

Nuodex also has available a data sheet on Fungitrol 50 describing uses of the new fungicide as a mildew-resistant treatment for light- and heavy-duty fabrics.

**HARSHAW INDUSTRIAL CHEMICALS**—*The Harshaw Chemical Co, 1945 East 97th St, Cleveland 6, Ohio*—This 22-page booklet is designed to acquaint the reader with The Harshaw Chemical Co and its extensive line of industrial chemicals, which are listed alphabetically from "acetic acid" to "zinc uversol solid 14.5%".

Profusely illustrated, the booklet gives a concise background of the Company, notes the Company's activities in various industrial chemical classifications, and provides other helpful information.

**MANUAL ON INDUSTRIAL WATER (3rd Printing—1956)**—*$6.00, American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa; cloth bound, 6 x 9", 502 pages*—The significant increase in the use of water for industrial processes makes the latest printing of ASTM Special Technical Publication 148-B a timely addition to the literature. Sponsored by ASTM Committee D-19 on Industrial Water, the Manual contains a complete appendix in addition to a comprehensive discussion of water, its uses, treatment, sampling, analysis, and difficulties caused by it.

The appendix lists ASTM standards relating to industrial water. It contains five methods of sampling, 41 standards, four methods of analysis, three standards for methods of reporting results, six standards for methods of test, a glossary of terms, a list of industrial water requirements and a bibliography.

Included in the latest printing are seven new methods and one important revision. Two additional proposed methods are published as additional information. No changes have been made in the chapters of the Manual.

**STAINLESS STEEL REPORT TO THE TEXTILE INDUSTRY**—*Allegheny Ludlum Steel Corp, Oliver Bldg, Pittsburgh 22, Pa*—This four-color booklet gives detailed information on the textile industry including yarn manufacturing, warp preparation, dyeing, bleaching, and finishing.

There is a section dealing with the corrosion resistance of Allegheny Ludlum stainless steels to various media, especially those met in the textile industry.

**SUL-FON-ATES** — *Tennessee Corp, Marketing and Development Dept, 1330 West Peachtree St, Suite 500, Atlanta 9, Ga*—This new summary sheet covers Tennessee Corp's complete line of anionic organic Sul-Fon-Nates, which are available in commercial and semiworks quantities.

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